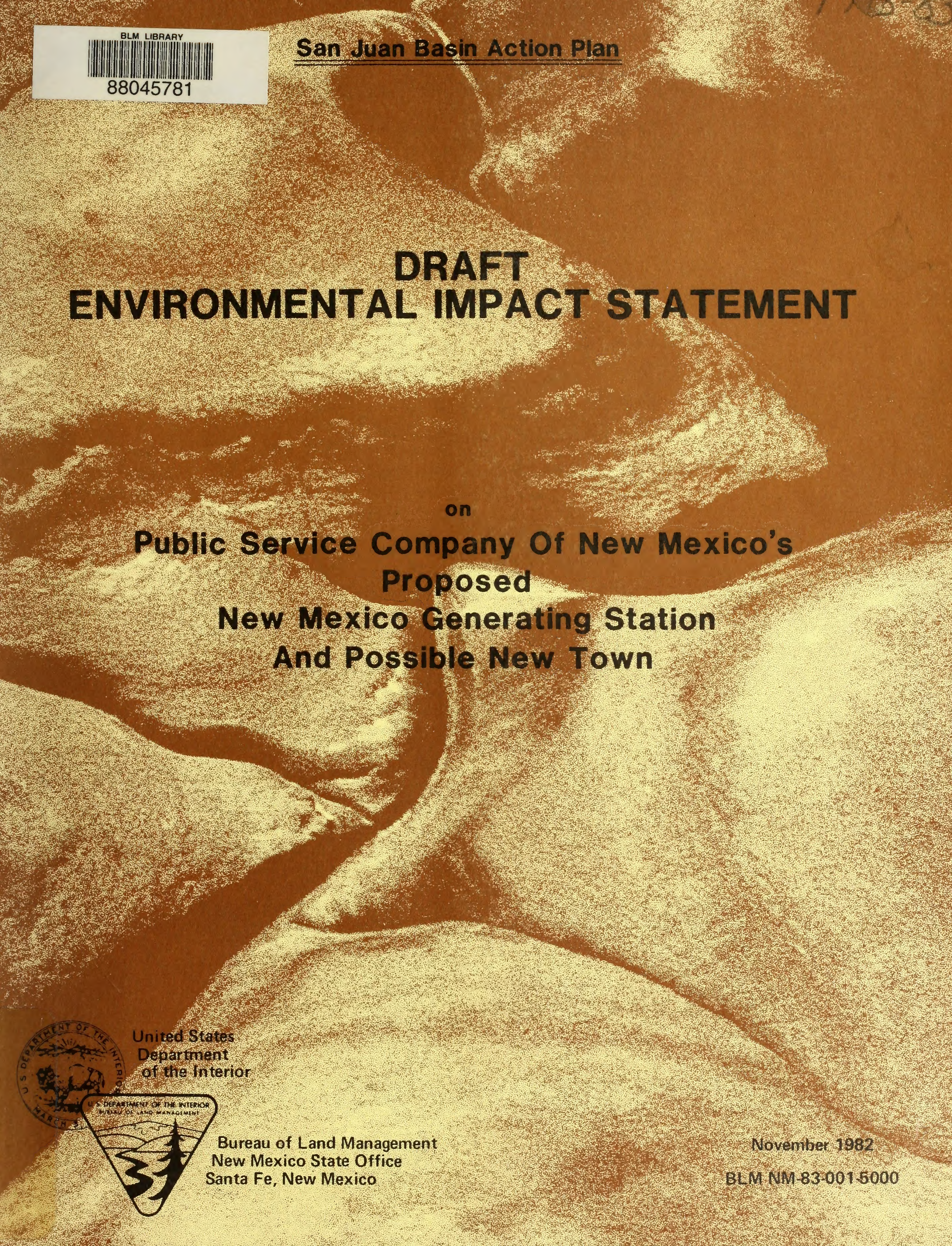
San Juan Basin Action Plan



DRAFT ENVIRONMENTAL IMPACT STATEMENT

on

Public Service Company Of New Mexico's Proposed New Mexico Generating Station And Possible New Town

United States
Department
of the Interior

Bureau of Land Management
New Mexico State Office
Santa Fe, New Mexico

November 1982

BLM NM-83-001-5000

NOTICE

This Draft Environmental Impact Statement (EIS) is one of a series of environmental and related documents coordinated by the Bureau of Land Management's (BLM) San Juan Basin Action Plan (SJBAP). This action plan considers the potential social, economic, and environmental effects of six separate but interrelated proposals within the San Juan Basin area of northwestern New Mexico. These proposals are:

- Coal Preference Right Leasing
- San Juan River Regional Coal Leasing
- Bisti, De-na-zin, and Ah-shi-sle-pah Wilderness Study Areas
- Ute Mountain Land Exchange
- New Mexico Generating Station
- Bisti Coal Lease Exchange

This EIS and the Draft Cumulative Overview (CO) document issued with it are an integral part of the SJBAP. These documents should be retained for use with the other SJBAP documents and with the Final EIS and CO. If changes resulting from public review and comment on this Draft EIS are relatively minor, the Final EIS will not reproduce the draft text in full. The Final EIS will, however, incorporate this document by reference and will include the necessary modifications and corrections to this draft, as well as a record of public comments and the responses to those comments.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
NEW MEXICO STATE OFFICE
P.O. BOX 1449
SANTA FE, NEW MEXICO 87501

IN REPLY REFER TO
NM 30840 EIS
1792.73 (934A)

OCT 26 1982

Dear Interested Citizen:

Enclosed for your review and comment is the draft Environmental Impact Statement (EIS) for Public Service Company of New Mexico's Proposed New Mexico Generating Station and Possible New Town (NMGS). This document was prepared by the BLM New Mexico State Office, NMGS Project Staff, with assistance from many formal and informal cooperating agencies (see Chapters 1 and 4) and the BLM Albuquerque District Office and Farmington Resource Area Office.

This draft EIS was prepared in compliance with the National Environmental Policy Act of 1969 (NEPA) and the final Council on Environmental Quality Regulations implementing the procedural provisions of NEPA. This statement is based on information supplied by many federal, state and local agencies, interested private organizations and individuals through the BLM's scoping and public participation process (summarized in Chapter 4). The purpose of this draft EIS is to disclose the potential social, economic and environmental effects of the NMGS proposal and its alternatives to ensure that these factors are adequately considered along with technical and other factors in the decision-making process.

This draft EIS is one of a series of environmental and related documents concerning the BLM's San Juan Basin Action Plan (SJBAP). This action plan considers six separate but interrelated actions proposed for the San Juan Basin Area of New Mexico (see Chapter 1 of this EIS) of which this proposed NMGS EIS, its associated Technical Reports and the SJBAP Cumulative Overview (CO) are an integral part. (The availability of the NMGS Technical Reports is discussed in Chapter 4 of this document.)

The public comment period on this EIS will begin November 30, 1982 and comments will be accepted until close of business, February 7, 1983, at:

State Director (934A)
Bureau of Land Management
New Mexico State Office
P.O. Box 1449
Santa Fe, New Mexico 87501

(A comment form has been included at the end of Chapter 4 for those who may wish to submit written comments.) Comments received after the close of the

review period will be considered in the subsequent decision process even though they may be too late for inclusion in the final EIS. Open houses and public hearings for this project have been scheduled as follows:

<u>Open Houses</u>: (All from 3:00-9:00 p.m.)
December 14; Convention Center, Albuquerque, NM
December 14; Civic Center, Farmington, NM
December 15; Chapter House, Crownpoint, NM
December 16; Kachina Lodge, Taos, NM
December 16; Holiday Inn, Gallup, NM

<u>Public Hearings</u>: January 10, 1983; Chapter House, Crownpoint, NM, beginning at 1:00 p.m.

January 12, 1983; Civic Center, Farmington, NM, beginning at 9:00 a.m.

January 14 (and 15, if necessary due to the number of registrants); Albuquerque, NM, Four Seasons Motor Lodge (I-40 and Carlisle Blvd.), beginning at 9:00 a.m. each day.

Please be aware that the open houses are primarily intended to inform the public and answer questions related to the San Juan Basin Action Plan proposals, whereas the public hearings are a formal mechanism for receiving oral and written testimony on the proposed SJBAP projects (NMGS, San Juan River Regional Coal Leasing DEIS and the Bisti, De-na-zin, Ah-shi-sle-pah Wilderness Study Areas DEIS).

I want to extend my sincere thanks to all of you who have participated in the development of this draft EIS and its associated Technical Reports. We are fully aware that many people devoted considerable time and effort to assist BLM in this important evaluation. We hope that you will continue to be involved in this and other SJBAP proposals during the next few years.

Sincerely yours,

Charles W Luscher

Charles W. Luscher
State Director

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

PUBLIC SERVICE COMPANY OF NEW MEXICO'S PROPOSED NEW MEXICO GENERATING STATION

ABSTRACT

The applicant, Public Service Company of New Mexico (PNM), proposes to construct a 2000-megawatt (MW) coal-fired steam electric generating station in San Juan County, New Mexico. On June 2, 1977, PNM filed applications with the Bureau of Land Management (BLM), New Mexico State Office, for the rights-of-way grants for a water supply system and for 500-kilovolt (kV) transmission lines that would connect to the proposed Rio Puerco Station near Albuquerque. The proposed NMGS, at ultimate development, would have four 500-MW generating units. Fuel for the plant would be obtained from surface coal mines, currently under lease, to be developed near the plant site. The power generated by the plant would be transmitted on a 500-kV loop connecting to the approved Four Corners-Ambrosia-Pajarito (FC-A-P) line and on two 500-kV transmission lines to a new substation to be constructed near Albuquerque, New Mexico; from there, it would be distributed throughout the PNM service area. Water to operate the plant would be delivered by two pipelines from the San Juan River. These linear features involve the following counties: San Juan, McKinley, Cibola, and Sandoval. Two alternative pipeline and transmission line routes were analyzed along with other alternatives. The No-Action and Delay-of-Action Alternatives were also analyzed.

Type of Action: (X) Administrative ( ) Legislative

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FTS 476-6187

Date Filed with EPA: Draft November 30, 1982
Final ________________

Dates of Comment/Review Period: November 30, 1982 to February 7, 1983

Charles W. Luscher

Charles W. Luscher
State Director, New Mexico

COOPERATING AGENCIES

The following agencies cooperated either formally (*) or informally in the preparation of this EIS and its associated technical reports. Formal Cooperating Agencies were agencies that entered into formal signed agreements (Memorandums of Understanding, etc.) with BLM concerning the preparation of this environmental document. Cooperating Agencies have provided technical input and review throughout the NEPA process to date, and their assistance is gratefully acknowledged.

- Bureau of Indian Affairs
  - Albuquerque Area Office*
  - Eastern Navajo Agency*
  - Navajo Area Office*
- Bureau of Reclamation*
- Corps of Engineers*
- Environmental Protection Agency
- Fish and Wildlife Service*
- Forest Service*
- Minerals Management Service*
- National Park Service*
- Soil Conservation Service
- U.S. Geological Survey
- New Mexico Energy and Minerals Department*
- New Mexico Environmental Improvement Division
- New Mexico Natural Resources Department
- New Mexico State Planning Office
- New Mexico Public Service Commission
- New Mexico State Engineer's Office
- New Mexico State Historic Preservation Officer
- Navajo Tribe*
- Zia Pueblo*

(date)

San Juan Basin Action Plan
Comment Form: Draft New Mexico Generating Station and
Possible New Town

Comments on this Draft EIS will be accepted
through the close of business February 7, 1983.

All comments should be sent to:

State Director (934A)
Bureau of Land Management
New Mexico State Office
P.O. Box 1449
Santa Fe, NM 87501

Please sign and date all forms.

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SUMMARY

NEW MEXICO GENERATING STATION

PNM proposes to construct a 2000-megawatt (MW) coal-fired steam electric generating station on the Bisti Lands in San Juan County, New Mexico. On June 2, 1977, PNM filed applications with the Bureau of Land Management (BLM), New Mexico State Office (NMSO) for rights-of-way (ROW) grants for a water supply system (application No. NM 30840) and for 500-kilovolt (kV) transmission lines (application No. NM 30841) that would connect to the proposed Rio Puerco Station near Albuquerque. In 1981 PNM filed application for another 500-kV line to extend from the proposed generating station to serve utilities in California, and perhaps Arizona. In July 1981, PNM withdrew its application for the out-of-state transmission line.

In response to PNM's applications, the BLM NMSO was designated Lead Agency for the preparation of this EIS, in accordance with the provisions of the National Environmental Policy Act (NEPA), the regulations of the Council on Environmental Quality (CEQ, 40 CFR 1500 through 1508), and BLM guidance. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. Such grants and permits would be contingent on the applicant's receipt of all other necessary permits.

PURPOSE AND NEED

According to the statement of purpose submitted to BLM by the applicant, PNM, the major purpose of the proposed NMGS is the generation of electricity using San Juan Basin coal to meet the forecasted need of PNM's system. The use of coal is desirable because it is available in New Mexico and can be permitted in PNM's planning time frame.

The ultimate authority for resolving the question of need rests with the New Mexico Public Service Commission when it considers PNM's application for a Certificate of Public Convenience and Necessity.

PROPOSED ACTION

PNM has filed applications with BLM for ROWs on public land for a water supply system and two 500-kV transmission lines that would be needed in the development of the proposed 2000-MW NMGS coal-fired steam electric generating plant. The proposed NMGS, at ultimate development, would have four 500-MW generating units. Fuel for the plant would be obtained from surface coal mines currently under lease, to be developed near the plant site. The power generated by the plant would be transmitted on a short 500-kV loop connecting to the approved Four Corners-Ambrosia-Pajarito (FC-A-P) line and on two 500-kV transmission lines to a new substation to be constructed near Albuquerque, New Mexico; from there, it would be distributed throughout the PNM service area. Water to operate the plant would be delivered by two pipelines from the San Juan River. The first generating unit could be required for commercial operation in 1990; other units could be available for operation in 1993, 1995, and 1998 respectively. The 500-kV loop connecting with FC-A-P would be in service in 1990; the first transmission line to the Albuquerque area would be in service in 1993; the second, in 1998.

ALTERNATIVES

In addition to the Proposed Action, several alternatives were identified. The alternatives considered in this analysis can be grouped into two categories: alternative project components and

alternatives to the entire NMGS project. Project component alternatives are summarized in Table S-1. Alternatives to the entire NMGS project include the noaction alternative and the delay-of-action alternative. The no-action alternative is defined as the NMGS project not being constructed. Consequences of the no-action alternative include several options (Table S-2) that PNM could consider to meet its forecasted need if the no-action alternative were selected. The delay-of-action alternative is defined as a delay of one or more years.

SCOPING

Sixteen scoping meetings were held in 1981 to identify the major issues, alternatives, and concerns for the NMGS EIS. These activities included meetings specifically oriented to one of the following groups: federal agencies, state agencies, local agencies, Native Americans, and the general public. In addition, four public meetings were held in 1982 to update the public on the status of the EIS process and to present for comment the alternatives to be addressed in detail in the EIS. The issues identified as major were air quality, water quality and supply, social and economic concerns (with focus on rural Navajos), cultural resource concerns, and need for the project.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

Alternatives, the applicant's Proposed Action, and the no-action and delay-of-action alternatives, were evaluated to determine their potential impacts. Impacts summarized here (detailed in Chapter 3 and compared in Chapter 1 of this EIS) include those identified as significant and others that are considered important by the public or which provide meaningful information for the comparison of alternatives.

Air Quality

Emissions from the proposed NMGS were analyzed using computer dispersion models to project maximum 24-hour and annual ambient concentration increases of pollutants (total suspended particulates, sulfur dioxide, nitrogen oxides, and carbon monoxide). Projected concentration increases, when combined with other existing point and area sources of air pollution, would result in total concentrations that would be less than New Mexico and federal ambient air quality standards.

No quantitative techniques are currently available with which to project acid precipitation formation and the effects due to a particular source. If increases occur in acid precipitation as the result of NMGS emissions, the alkaline nature of soil in the San Juan Basin and the presence of soil in local waterways would serve as a buffer and minimize impacts to living resources in the San Juan Basin. However, there is potential for impacts associated with acid precipitation in those areas outside the San Juan Basin that are poorly buffered, and thus susceptible to reductions in pH. From information in the available literature, it was determined that areas that would be most susceptible to acid precipitation include lakes, headwater streams, and poorly buffered soils in high mountain areas of northern New Mexico and southern Colorado. Assuming that acid precipitation would occur and would be related to SO_2 and NO_x levels, NMGS could produce impacts by contributing to cumulative emissions in the region. Considering total emissions projected for a three-state area (New Mexico, Utah, and Colorado), NMGS would contribute approximately 3 percent of the total emissions which may be related to the formation of acid precipitation.

Visibility analyses indicate that the plume from the proposed NMGS would be slightly visible from the San Pedro Parks Wilderness Area and Mesa Verde National Park. Because of the distance of those sites from the proposed NMGS (75 miles), neither plume perceptability nor visibility impairment would be frequent or significant. Viewed from Chaco Culture National Historical Park, perceptible plume discoloration is predicted to occur approximately 36-37 mornings and 5-6 afternoons per year, with maximum occurrence during winter. Highly perceptible plume discoloration is predicted to occur about 1-2 mornings per year. Although

Table S-1. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS

	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
NMGS	Four 500-MW coal-fired units completed 1990-2000	No action (other means of providing for need) Delay of action	No action Delay of action
Project Component			
Site	Bisti	McKinley County Torrance County	McKinley County Torrance County
Fuel Supply System			
Coal supply	Sunbelt and Arch Minerals joint venture	Other San Juan Basin coal producers Coal sources outside San Juan Basin	Other San Juan Basin coal producers
Coal handling	Trucked to NMGS site, conveyor belt to active and emergency storage piles on-site	Coal transported by conveyor belt to site and then to power plant Off-site storage of run-of-mine coal	Coal transported by conveyor belt and then to power plant Off-site storage of run-of-mine coal
Pollution Control Systems			
Particulate removal	Fabric filter	Electrostatic precipitator	Electrostatic precipitator
SO_2 control	One of the following: • Wet limestone scrubbing • Alkali spray-drying	Wet limestone scrubbing, lime spray-drying, dry types, regenerable types	None
NO_x control	One of the following: • Dual-register burner • Tangentially fired steam generation • Controlled-flow/split-flame burner	Low NO_x boiler design, flue gas recirculation	None

Table S-1. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (continued)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Solid waste disposal	Return to coal mine for layered disposal	Marketing of fly ash for commercial products	None
		Random dumping in mined-out pits	
		Off-site landfill	
		On-site landfill	
Heat Rejection System	Wet-type cooling towers	Wet-dry cooling towers	Wet-dry cooling towers
		Once-through cooling	
		Cooling ponds	
		Natural-draft cooling towers	
		Dry mechanical-draft cooling towers	
Water Supply System			
Water supply sources	35,000 acre-feet/year (ac-ft/yr) from San Juan River	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from well field	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from well field
		20,000 ac-ft/yr from San Juan River (if wet/dry-cooling towers)	20,000 ac-ft/yr from San Juan River (wet/dry-cooling towers)
		35,000 ac-ft/yr from well field	
		35,000 ac-ft/yr from uranium mine dewatering	
		20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from uranium mine dewatering	

Table S-1. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (concluded)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Surface-water diversion (intake)	Near Farmington	Near Bloomfield	Near Bloomfield
Water supply pipeline	Alignment paralleling NM Highway 371 (P1), originating at Farmington	P2 alignment paralleling existing pipeline ROW (El Paso Natural Gas), originating near Bloomfield P3 also originating near Bloomfield	P2, P3
Reservoir	2 miles south of NMGS site, T23N, R13W, Section 36 (R1)	R2 approximately 3 miles southeast of proposed NMGS site	R2
Transmission System			
Transmission Lines	T5, T2, T1	T3, T4	T3, T4
Station	Rio Puerco	None	None

Table S-2. NO-ACTION ALTERNATIVES

Coal conversion plant	A coal gasification facility in conjunction with either a combined-cycle or fuel-cell generating plant. This would probably not be commercially available until the mid-1990s.
Decentralized coal-fired steam electric system	Two or more small coal-fired plants with the same combined capacity as NMGS, built at two or more locations.
Geothermal plant	A generating plant using steam from underground high-temperature (>150°C) hot water reservoirs.
Nuclear plant	A light-water fission reactor plant. Operation of such a plant could probably not commence until the mid-1990s.
Out-of-state power source	This alternative would rely on either contract purchase of out-of-state power or equity participation in one or more out-of-state generation projects.
Renewable resource alternatives	This is a combination strategy involving a variety of renewable generation resources, possibly including large hydroelectric, central-station solar-thermal electric and photovoltaic, decentralized photovoltaic, central-station wind, agricultural and forestry wastes, and wood-fired generation. Energy storage might be required with this alternative.
Other sites	Other sites potentially capable of supporting a 2000-MW coal-fired steam electric generating station may have to be considered.
Alternative uses of San Juan Basin coal	The coal may either be used locally within the basin for another proposed facility, such as a coal gasification plant, or exported for use outside the basin.

not quantifiable, NMGS would contribute to the regional haze now visible from Chaco Culture National Historical Park.

Noise

Based on noise monitoring at the existing San Juan and Four Corners power plants, no significant impacts resulting from construction and operation of the proposed NMGS would be expected beyond 0.5 mile and no detectable impacts would be expected beyond 2 miles. No significant impacts would be expected at the Bisti and De-na-zin Wilderness Study Areas (WSAs), since they are located 2.1 and 3.5 miles from the proposed NMGS.

Geology

No impacts to unique geologic features or locations of unusual scientific value were identified. Potential geologic hazards to some project components were identified that should be considered during design and construction phases of the proposed project.

Mineral Resources

Operation of NMGS would result in consumptive use of 300 million tons of coal and 4 million tons of limestone over the projected 40-year project life. The consumption of 300 million tons of coal would be considered a significant impact on a local and regional level because more than 1 percent of the estimated strippable coal reserves in the Bisti area (local) and within a 30-mile radius of the NMGS plant site (regional) would be unavailable for future beneficial use. From a national perspective, this coal consumption would not constitute a significant impact and is consistent with national energy policy and goals.

Paleontological Resources

Several of the proposed and alternative NMGS project components would occupy areas that are in highly sensitive paleontological zones. Highly sensitive zones for the Proposed Action include the entire plant site, 2 linear miles of water pipeline P1, 50 linear miles of transmission line T1, and 3 linear miles of transmission line T5. Highly sensitive zones for alternative project components include 2 linear miles of water pipeline P2, 13 linear miles of water pipeline P3, and 3 linear miles of transmission line T4.

Areas of significant paleontological resources for which no resource recovery program is stipulated or implemented would be adversely affected, either directly by the destruction, damage, or alteration of bedrock formations or indirectly by increased recreational fossil collecting or commercial collection of materials.

Soils

Soils would be affected and potentially significant impacts could occur as the result of construction activities associated with any of the proposed or alternative NMGS project components. Major concerns would be areas susceptible to wind or water erosion, areas with steep terrain, or areas difficult to reclaim once topsoil is removed. High erosion susceptibility exists over 100 percent of the proposed NMGS site, 84 percent of water pipeline P1, 74 percent of transmission line T1, 69 percent of transmission line T2, and 100 percent of transmission line T5. High erosion susceptibility on alternative project components includes 73 percent of water pipeline P2, 77 percent of water pipeline P3, 66 percent of transmission line T3, and 59 percent of transmission line T4. The significance of these impacts would be reduced by implementation of the applicant's erosion control measures specified in Chapter 1.

Water Resources (Hydrology and Water Quality)

Proposed Water Supply System. The average annual supply of water in the San Juan River in New Mexico would be depleted by 35,000 acre-feet per year (ac-ft/yr). Streamflow would be reduced by an average of 48 cubic feet per second (cfs) downstream of the intake structure. Reductions in streamflow would not be significant even during critical dry periods (low flow; defined as streamflow of 520 cfs at Farmington). No significant impacts to water quality were identified.

Alternative Water Supply System. The average annual supply of water in the San

Juan River in New Mexico would be depleted by 20,000 ac-ft/yr. Streamflow would be reduced by an average of 28 cfs. Reductions in stream-flow would not be significant during critical dry periods (low flow). No significant impacts to water quality were identified.

Consumptive use of 15,000 ac-ft/yr of ground water from a well field near the proposed NMGS would result in significant drawdowns to the Westwater Canyon Member, Dakota Sandstone, and the Entrada Sandstone aquifers in the San Juan Structural Basin. Maximum drawdowns (approximately 3000 feet) in the Westwater Canyon Member would occur in the vicinity of the well field in the year 2033. Measurable land subsidence would probably not result from the withdrawal of ground water to a significant level (greater than 1 foot).

Pumping of the well field could cause a reduction in the flow of springs in the Chuska Mountains. Available information is not sufficient to quantify whether the reduction in flow would be significant (i.e., greater than 15 percent of average daily flow). Pumping from the well field would also decrease the natural groundwater discharge into the San Juan River, Rio San Jose, Rio Puerco, and Puerco River by up to 0.09 cfs. This impact would not be significant.

Vegetation

Approximately 2400 acres of vegetation would be removed at the proposed NMGS site for the life of the project. This would not be a significant impact because the vegetation types removed are common in the region. Vegetation on water pipeline corridors or transmission line corridors would be temporarily disturbed during construction activities but should become reestablished with the aid of successful reclamation. No impacts to unique regional vegetation were identified (i.e., removal of more than 1 percent of a unique type, such as riparian vegetation).

Wildlife

The most direct construction impact on wildlife would be the clearing of wildlife habitat from the proposed NMGS site and proposed or alternative ROWs. This is not considered a significant impact on the plant site because no crucial wildlife habitat is present. Within proposed and alternative transmission line or water pipeline corridors, a limited amount of crucial wildlife habitat would be disturbed by construction activities. Linear miles of crucial mule deer winter range crossed by water pipelines include 2.8 miles, P1; 1 mile, P2; 1 mile, P3. Linear miles of mule deer and elk crucial winter range crossed include 12.0 miles for transmission line T4. The impacts would not be significant because less than 1 percent of the crucial regional winter range would be disturbed.

Other impacts on wildlife would include interruption of habitat continuum and impacts associated with human presence and activity. Human disturbance to big game on winter range could occur along water pipelines P1, P2, and P3 and transmission line T4. Human disturbance to nesting raptors could occur along any of the proposed or alternative transmission lines but none of the water pipelines. Greater hunting and fishing pressure would also occur as the result of increased human populations associated with construction and operation of NMGS.

Threatened and Endangered Species

The construction of the proposed NMGS would not affect any federal or state threatened, endangered, or candidate species. Operation of the NMGS may affect one plant species, the Mancos milkvetch, and one animal species, the greenback cutthroat trout. These two species may be affected because of acid precipitation that could result from NMGS emissions. The Mancos milkvetch may be affected because soils that support this species are not well buffered and may be susceptible to decreases in pH. The greenback cutthroat trout may be affected because headwater streams in high mountain areas of Colorado that support this species are poorly buffered and are susceptible to decreases in pH that could result from acid precipitation.

Proposed and alternative project components other than the proposed NMGS plant site may affect one additional threatened species, the Mesa Verde cactus. Potential habitat for this species is present in areas traversed by proposed transmission line T5 and proposed water

pipeline P1. In addition potential habitat is present in areas that would be traversed by alternative transmission line T4 and alternative water pipelines P2 and P3. If any of these alternatives are selected, a survey would be initiated to determine if the species is present and would be affected. Potential impacts to this species would be minimized through compliance with regulations associated with its protected status.

Cultural Resources

The proposed construction and operation of the NMGS, water supply system, and transmission system would directly alter, damage, or destroy an unknown number of presently unidentified, as well as identified, archaeological and historic sites or sites of importance to traditional Native American values. Significant indirect adverse impacts could also occur as a result of exposure and increased uncontrolled collection of archaeological resources. In addition, indirect impacts could include increased collection of Native American materials and decreased opportunity for Native Americans to maintain a traditional lifestyle, which requires the maintenance of sacred sites. The extent and magnitude of impacts resulting from construction of any of the proposed or alternative NMGS project components cannot be determined until a site-specific inventory and evaluation is conducted for areas delineated by the State Historic Preservation Officer.

Visual Resources

Construction and operation of the proposed NMGS would result in contrast ratings that exceed BLM visual resource management (VRM) objectives; thus these impacts would be significant. Visual impacts would be most apparent from within the Bisti WSA, a 3-mile viewing distance from NMGS. Contrast ratings would also be exceeded and significant visual impacts would occur on each of the proposed and alternative transmission line study areas. Miles of ROW that would exceed contrast ratings for BLM VRM Class II and Class IV areas include: 25 miles, T1; 10 miles, T2; 30 miles, T3; and 15 miles, T4. No contrast ratings would be exceeded along any of the proposed or alternative water pipelines.

Recreation and Wilderness

Construction activities, noise, visual contrast, and dust would significantly detract from the quality of recreation experiences in the WSAs located near project components. Recreation experiences at the Bisti and De-na-zin WSAs would be particularly affected by activities at the proposed plant site. Increased visitor use (camping, picnicking) in areas including Navajo Lake State Park, Angel Peak, Chaco Culture National Historical Park, Bisti WSA, and De-na-zin WSA could result in significant increases in litter, vandalism of cultural resources, fire, and removal of paleontological material. These impacts could degrade the quality of recreation resources. Recreational use of off-road vehicles (ORVs) near WSA boundaries could significantly affect the primitive and unconfined recreational experience in areas used for hiking and picnicking. ORV use may also result in increased damage to vegetation and soils throughout the project area.

Transportation

The only transportation alternative that excludes truck transport of materials along New Mexico Highway (NM) 371 to the proposed NMGS site assumes completion of the Star Lake or Con Paso railroad spur project. If the Star Lake-Bisti railroad spur is not used, significant travel delays would occur during the construction phase along the southern stretches of NM 371 and U.S. 666-Navajo 5 from Interstate 40. Travel delays along NM 57 would be most significant during months when visitation is highest at Chaco Culture National Historical Park. Significant delays and safety problems would also occur on NM 371 with the addition of 650 vehicles during peak commute periods for peak operation employment years, particularly as commuter vehicles mix with haul trucks. Further impacts could occur on NM 44 if project personnel commute from Bloomfield via County Road 15. Significant increases over baseline traffic flows are also projected in Farmington and Bloomfield due to project employees residing in those areas. The

estimated addition of vehicles to crosstown traffic in Farmington during peak commute periods of the day for peak employment years is 650 or a percentage increase of 10-20.

Social and Economic Conditions

Total NMGS project-related labor requirements would exceed 1600 jobs for construction and 900 for operation. Approximately $780 million would be added to the region in direct and indirect income. An increase in assessed valuation of affected taxing jurisdictions would make increased revenues available for the region's municipalities and the Farmington Municipal School District. Significant impacts to human services could occur; agencies are already near capacity, and future funding sources are uncertain. Potentially significant impacts could occur if projected housing demand exceeds the availability of units (peak demand due to NMGS construction work force would be 600 units in 1986-87). Impacts may include increases in housing costs and in the proportion of mobile homes. Other significant impacts could occur to human service delivery capacities and to certain traditional Navajos and future generations whose opportunities to practice traditional lifestyles would be diminished.

Delay of construction of Units 2, 3, and 4 by one year would have a beneficial impact, since employment needs on other major projects in northern San Juan County are expected to decrease in 1991, 1992, and 1993. If NMGS work force needs were higher in those years, worker inmigration would be less and local unemployment would be reduced.

If construction of units were delayed so that peak NMGS employment demand coincided with high labor demand from other projects in the region (e.g., 1987, 1989, 1996, 1997), social and economic impacts would be more adverse. Greater inmigration of new workers to the area would result in increased demand for community facilities and services. Housing, schools, human services, and traditional lifestyles in the affected region would be strained.

Delays between construction of NMGS units would generally have an adverse effect on social and economic conditions in the affected region. Unless they are assured of continued local employment opportunities, workers are likely to migrate out of the area as NMGS needs taper off with the completion of individual units. This would aggravate fluctuations in local population.

Land Use Controls and Constraints

There would be no conflicts with existing land use plans or controls.

AGENCY'S PREFERRED ALTERNATIVES

NMGS alternatives are summarized in Table S-1. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. Use of these grants and permits would be contingent on the applicant's receipt of approximately 30 other necessary permits and approvals for NMGS (see Authorizing Actions). Selection of plant system alternatives would be made during these other permitting processes. For example, selection of Best Available Control Technology for air quality would be made during the PSD (Prevention of Significant Deterioration) application process; and approval of the ultimate water supply system rests with the New Mexico State Engineer (and may include the Interstate Stream Commission, the Bureau of Reclamation, and the Secretary of the Interior).

BLM's primary responsibility for this proposal would involve ROW grants for the linear features of NMGS. Based on impact analysis (see Chapter 3 and Tables 1-7, 1 8 and 1-9), BLM has selected preferred alternatives as follows:

Water System Alternatives

- P1, which implies the proposed intake structure near Farmington and reservoir R1. The route for pipeline P1 is the shortest distance and would be located within an existing highway ROW for approximately 75 percent of its length.

Transmission System Alternatives

- T5 corridor for the 5-mile connecting loop to the approved FC-A-P for the first 500-kV line

- T3 for the second 500-kV transmission line
- T2 for the third 500-kV transmission line.

Of the four alternatives, T2 and T3 are the shortest in length and follow the greatest number of miles of existing ROWs. In addition, T2 and T3 would cross the least amount of recoverable coal.

- The Rio Puerco Station is selected as the terminus point for both T3 and T2.

AREAS OF CONTROVERSY

Areas of controversy have been raised by the public and agencies throughout the EIS process. Of the issues raised (see Chapter 4), environmental issues that were within the scope of this EIS are discussed in Chapter 3. Other areas of controversy include the following:

- Navajo-Hopi Relocation Act - selection of 35,000 acres of public land in northwestern New Mexico which includes the proposed site for NMGS.
- Navajo lawsuit - claiming 2 million acres of land in northwestern New Mexico which includes the proposed site for NMGS.
- Is there a need for power from NMGS?
- Cumulative impacts of the proposed San Juan Basin development to Chaco Culture National Historical Park.
- Availability of a water source for 35,000 acre-feet per year.
- Proximity of the proposed NMGS site to the Bisti and De-na-zin WSAs and Chaco Culture National Historical Park.
- Is there a need for development of a new town?

POSSIBLE NEW TOWN

The feasibility of a new town on lands included in the Ute Mountain Land Exchange is under study by Paragon. A new town is being assessed in this EIS because, in addition to the proposed NMGS, it represents a possible end use of the exchange. The new town is not part of the NMGS proposal. The purpose of the possible new town would be to accommodate a labor force and their families in closer proximity to planned and possible industrial development than the greater Farmington area. The need for the possible new town is not established at this time.

Anticipated levels of population influx in northwestern New Mexico due to the proposed actions under consideration in the SJBAP or other planned development do not, at this time, appear to warrant this large and complex venture. Given the high level of uncertainty about whether the possible new town would ever be developed, this EIS does not assess potential impacts in detail. Instead, a general discussion of the types of impacts that could be expected is presented. Should a new town development become feasible, applications for ROWs across public lands would be needed to provide the town with utilities and other community facilities. These proposals would be subject to the full NEPA process, with a detailed evaluation of expected impacts, based on the applicant's planning and engineering description of the proposals. The new town assessment is discussed separately in this EIS.

INTRODUCTION AND SCOPE OF THIS EIS

INTRODUCTION

The applicant, Public Service Company of New Mexico (PNM), proposes to construct a 2000-megawatt (MW) coal-fired steam electric generating station in San Juan County, New Mexico. On June 2, 1977, PNM filed applications with the Bureau of Land Management (BLM), New Mexico State Office (NMSO), for ROW grants for a water supply system (application No. NM 30840) and for 500-kilovolt (kV) transmission lines (application No. NM 30841) that would connect to the proposed Rio Puerco Station near Albuquerque. In 1981, PNM filed application for another 500-kV line to extend from the proposed NMGS to serve utilities in California, and perhaps Arizona. In July 1981, PNM withdrew its application for the out-of-state transmission line.

In response to PNM's applications, the BLM NMSO was designated Lead Agency for the preparation of this Environmental Impact Statement (EIS), in accordance with the provisions of the National Environmental Policy Act (NEPA), the regulations of the Council on Environmental Quality (CEQ, 40 CFR 1500 through 1508), Departmental Manual 516, and BLM guidance. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. Use of these grants and permits would be contingent on the applicant's receipt of the approximately 30 other necessary permits and approvals for NMGS. These are summarized in the Authorizing Actions section of NMGS Chapter 1.

Paragon Resources, Inc., a subsidiary of PNM, has proposed to exchange 17,138 acres of private land (Ute Mountain Lands) in Taos County, New Mexico, for approximately 8400 acres of public lands near Bisti, New Mexico. The present use of these lands is grazing. The proposed end uses include a 2400-acre site for the proposed New Mexico Generating Station (NMGS) and a possible future 2400-acre site for a new town. The balance of these lands would continue to be used for grazing. This possible land exchange was the subject of a recent Environmental Assessment (EA) (BLM 1981), as part of BLM's San Juan Basin Action Plan (SJBAP). If the land exchange is not approved, other options are available that could make the land available for location of the generating station. These options include such actions as a rights-of-way (ROW) grant, sale, or lease.

In an effort to avoid duplication, opportunity for early involvement and cooperation in the EIS process has been provided to numerous agencies. This involvement has been provided for by either a formal Cooperative Agreement (on file at BLM NMSO) or an informal letter of cooperation. Cooperating Agencies for this EIS are listed below (* indicates informal cooperating agencies).

- Federal
  Department of Agriculture
  - Soil Conservation Service*
  - U.S. Forest Service

  Department of the Interior
  - Bureau of Indian Affairs
    Albuquerque Area Office
    Eastern Navajo Agency
    Navajo Area Office
  - Minerals Management Service, South-Central Region
  - National Park Service
  - U.S. Geological Survey*
  - U.S. Fish and Wildlife Service
  - U.S. Bureau of Reclamation

Environmental Protection Agency, Region VI

U.S. Army Corps of Engineers

- State of New Mexico
  Energy and Minerals Department
  Environmental Improvement Division*
  Historic Preservation Bureau*
  Natural Resources Department*
  Public Service Commission*
  State Engineer's Office*
  State Planning Office*

- Tribal
  Navajo Tribe
  Pueblo of Zia

Many of these and other agencies have their own environmental analysis requirements for their permits. Efforts have been made to supply sufficient analyses for use by other agencies. Several agencies have requirements for specifically structured detailed analyses, which would be provided during subsequent permitting processes.

The proposed site for the NMGS is located in the San Juan Basin of northwestern New Mexico (see Map 1-1 in NMGS Chapter 1). The BLM is responsible for the management of much of the land and mineral resources in this area, and currently has six separate but interrelated proposals under consideration within the basin. In order to respond to these, the BLM has developed the SJBAP. This plan provides for the organizational arrangements whereby the environmental assessment process and public review can be implemented in a timely and efficient manner. The plan describes the process for preparation of three site-specific EISs, including the NMGS EIS, and three EAs:

- Coal Preference Right Leasing (EA) (completed)
- San Juan River Regional Coal (EIS)
- Bisti, De-na-zin, and Ah-shi-sle-pah Wilderness Study Areas (EIS)
- Ute Mountain Land Exchange (EA) (completed)
- New Mexico Generating Station (EIS)
- Bisti Coal Lease Exchange (EA)

In addition to these documents, the action plan provides for the preparation of a Cumulative Overview (CO), which considers the cumulative impacts of these proposed actions. The CO, and documentation on which it is based, is incorporated in this EIS by reference.

In the preparation of this EIS, reference has been made to relevant environmental documents. This tiered approach incorporates a comprehensive data base without re-creation of the information contained in other non-SJBAP documents. Documents to which this EIS is related include the San Juan Basin Regional Uranium Study, Star Lake-Bisti Regional Coal EIS, San Juan Grazing Management EIS, and the BLM Chaco-San Juan Management Framework Plan (MFP) Amendments (1981).

LEVEL OF ANALYSIS

New Mexico Generating Station

This EIS focuses on potentially significant impacts associated with the following resource topics: air quality, water quality and quantity, cultural resources, social and economic conditions, Native Americans, paleontological resources, threatened or endangered species, visual and recreation resources, wilderness values, and transportation. Less emphasis is given to resources that are not expected to be significantly affected or of major public concern, such as climate, geology, minerals, common species of vegetation or wildlife, and land use controls and constraints.

The impact analysis for power plant facilities is based upon current specifications for design and operation of power plant systems. In cases where final selection of design features has not been made by the applicant, impact analysis is based on the assumption that applicable regulations and standards would be met. This EIS does not address the issues of best available control technologies, which would be required under various permitting processes that are outside the scope of this EIS.

The assessment for pipelines routes assumed a 90-foot construction disturbance. Generally, the transmission line evaluations assumed a 200-foot ROW centered in a 1-mile study area corridor. If placement of the line elsewhere in the study area would result in different impact findings, such differences were noted. This EIS is intended to supply

information from which a selection of corridors can be made. Once a corridor is selected, centerline surveys would be conducted to identify the exact alignment. Route-specific stipulations would be developed at that time. Site-specific supplemental environmental analyses would be done where necessary.

Impacts of coal handling and processing from the delivery point at the NMGS to the proposed disposal area are addressed in detail. Since the proposed coal source(s) have existing leases, impacts due to coal have been or would be addressed on a site-specific basis in an environmental assessment that the Office of Surface Mining would prepare for individual mine plans.

Impacts that would result from NMGS were evaluated assuming environmental conditions as they would be when NMGS would start construction in 1985. Since that date is several years away, two existing environments in the San Juan Basin were considered to be in place by that time for the impact analysis. These two existing environments are described in Appendix C. Only differences in analysis findings for the two existing environments are discussed where they apply.

Possible New Town

The possible new town is not part of the NMGS proposal. It is being assessed in this EIS because it is proposed as a possible end use of the Ute Mountain Land Exchange. The feasibility of a new town on lands included in this exchange is under study by Paragon. However, currently anticipated levels of population influx in northwestern New Mexico due to the proposed actions under consideration in the SJBAP or other planned development do not, at this time, appear to warrant this large and complex venture.

Given the high level of uncertainty about whether the possible new town would ever be developed, this EIS assesses potential impacts generally, presenting a discussion of the types of impacts that could be expected.

Should a new town development become feasible, applications for ROWs across public lands would be needed to provide the town with utilities and other community facilities. These proposals would be subject to the full NEPA process, with a detailed evaluation of expected impacts, based on the applicant's planning and engineering description of the proposals. The assessment of the possible new town is discussed later in this EIS.

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Chapter 1

PROPOSED ACTION AND ALTERNATIVES

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

BACKGROUND

The applicant, Public Service Company of New Mexico (PNM), has submitted to the Bureau of Land Management (BLM) its statement of purpose and need for the New Mexico Generating Station (NMGS) (see Appendix E). The question of whether NMGS is needed has been a recurrent issue in public meetings and written communications for this Environmental Impact Statement (EIS). The ultimate authority for resolving this issue rests with the New Mexico Public Service Commission (PSC) when it considers PNM's application for a Certificate of Public Convenience and Necessity. It is the PSC that regulates PNM's legal mandate to provide electricity when it is needed. PNM has not submitted such application for NMGS. Presentation of PNM materials supporting its statement of need and a discussion of other information on growth projections for New Mexico and the need for electricity are detailed in the Purpose and Need Technical Report. The following discussion presents the applicant's statement of purpose and forecasts of the need for electricity. Relevant communications from PNM to BLM are contained in Appendix E of this EIS.

PURPOSE

The applicant's statement of purpose states that the major purpose of the project is the generation of electricity using San Juan Basin coal to meet the forecasted need of PNM's system. The applicant indicates that the generation of electricity is needed because of projected demand growth and that the use of coal is desirable because it is available in New Mexico. A coal-fired steam electric generating station also appears to be licensable in PNM's planning time frame.

According to the applicant:

> the purpose of this phase of the New Mexico Generating Station (NMGS) Project is to provide the management of the Public Service Company of New Mexico (PNM) with sufficient information to assess the benefits and risks of developing a coal-fired generating station. This risk and benefit analysis will be evaluated against a full range of options to meet the electrical energy needs of PNM's customers in the 1990s and beyond. Among the options considered by PNM are nuclear, geothermal, solar, hydro, conservation, and others. In order to make the best decision, PNM management requires information related to the feasibility and availability of such coal-related resources as land, water, and fuel. Additionally, PNM management requires information regarding the suitability of the proposed project's impact on the human and natural environments in accordance with the NEPA process. As set forth in the July 10, 1981, letter from PNM to BLM, the proposed project consists of a coal-fired generating station with up to four 500-MW units. The units will be placed in service in the 1990s, with the first possibly as early as May 1990. Associated with the generating station are two 500-kV transmission lines to Albuquerque, a 500-kV tie to the Four Corners-Ambrosia 500-kV lines, and two water pipelines from San Juan River to the generating station.

NEED

PNM serves a large part of north-central New Mexico, including Albuquerque, Santa Fe, and other communities. PNM currently serves a total population of about 565,000, of which about 80 percent live in the Albuquerque area (PNM 1981a). The applicant's forecasted need is presented below.

PNM's Historical Electrical Needs

The electrical needs served by PNM and New Mexico Electric (NME) grew at an average annual rate of 8.2 percent over the period 1971-1980 and were 6121 gigawatthours (GWh) in 1980, including sales for resale. During this period, sales for resale (that is, sales of electricity to another party, which in turn resold the electricity) by PNM grew at a faster rate than direct sales by PNM to end users. If sales for resale and NME requirements are excluded, then the electric needs served by PNM grew at an annual rate of 5.6 percent from 1971 to 1980 and stood at 3903 GWh in 1980. (Note that NME's electrical requirements are considered here because PNM and NME are currently actively pursuing a merger, after which PNM plans to meet the electrical needs of NME customers.)

PNM's Assessment of Need

In presenting its assessment of the need for NMGS, PNM has addressed uncertainties about future electrical needs by considering five different scenarios (sets of assumptions) about possible future conditions in New Mexico: low, middle, strong growth, high, and potential industrial. PNM states (Waldman 1982) that "the high and low growth scenarios . . . are intended to bracket the range of growth likely to be achieved within the PNM service area." The strong growth scenario is the average of the middle and high scenarios, and PNM states (PNM 1981b) that it "believes [the strong growth scenario] is the realistic scenario upon which to develop prudent long-term system expansion plans which afford PNM the ability to meet the energy requirements of an economically strong New Mexico economy." PNM has used the strong growth scenario when presenting calculations to show the need for NMGS. PNM further states (PNM 1981b) that the potential industrial scenario is "a scenario whose load [electrical need] estimates are based on actual inquiries and preliminary negotiations with companies considering building large new facilities which would require PNM electric service."

Figure 1-1 shows PNM's assessment of future electrical needs for each of the five scenarios. It also shows PNM's existing and planned generating capacity, both with and without NMGS. The planned new generating units, excluding NMGS, are as follows:

- San Juan Generating Station, Unit 4 (1982)
- Palo Verde Nuclear Generating Station, Unit 1 (1983)
- Palo Verde Nuclear Generating Station, Unit 2 (1984)
- Palo Verde Nuclear Generating Station, Unit 3 (1986)

The capacity changes that are plotted in Figure 1-1 also assume that in 1995 Tucson Electric Power exercises its option to buy back 136 megawatts (MW) from San Juan Generating Station, Unit 4, and that in the same year PNM purchases 20 MW from the City of Farmington. Figure 1-1 further assumes that NMGS would consist of four 500-MW generating units operating at a capacity factor of 0.65 with the following schedule for commercial operation:

- Unit 1, 1990
- Unit 2, 1993
- Unit 3, 1995
- Unit 4, 1998

PNM's Need Assessment Process

To prepare the forecasts used in its statement of need for NMGS, PNM used a forecasting model based on trend analysis. This type of model uses historical data on a variety of input variables to develop formulas for estimating the future level of electric sales, given the future levels of the input variables.

PNM's load forecasts are described in detail in "1981-2001 Forecast of Energy Sales and Peak Demands" (PNM 1981c). Forecasts of sales are prepared for five customer classes: residential, commercial, industrial, miscellaneous, and the City of Gallup (a wholesale buyer). Forecasts are developed separately for each operating division, and the results are summed to obtain total sales. Once

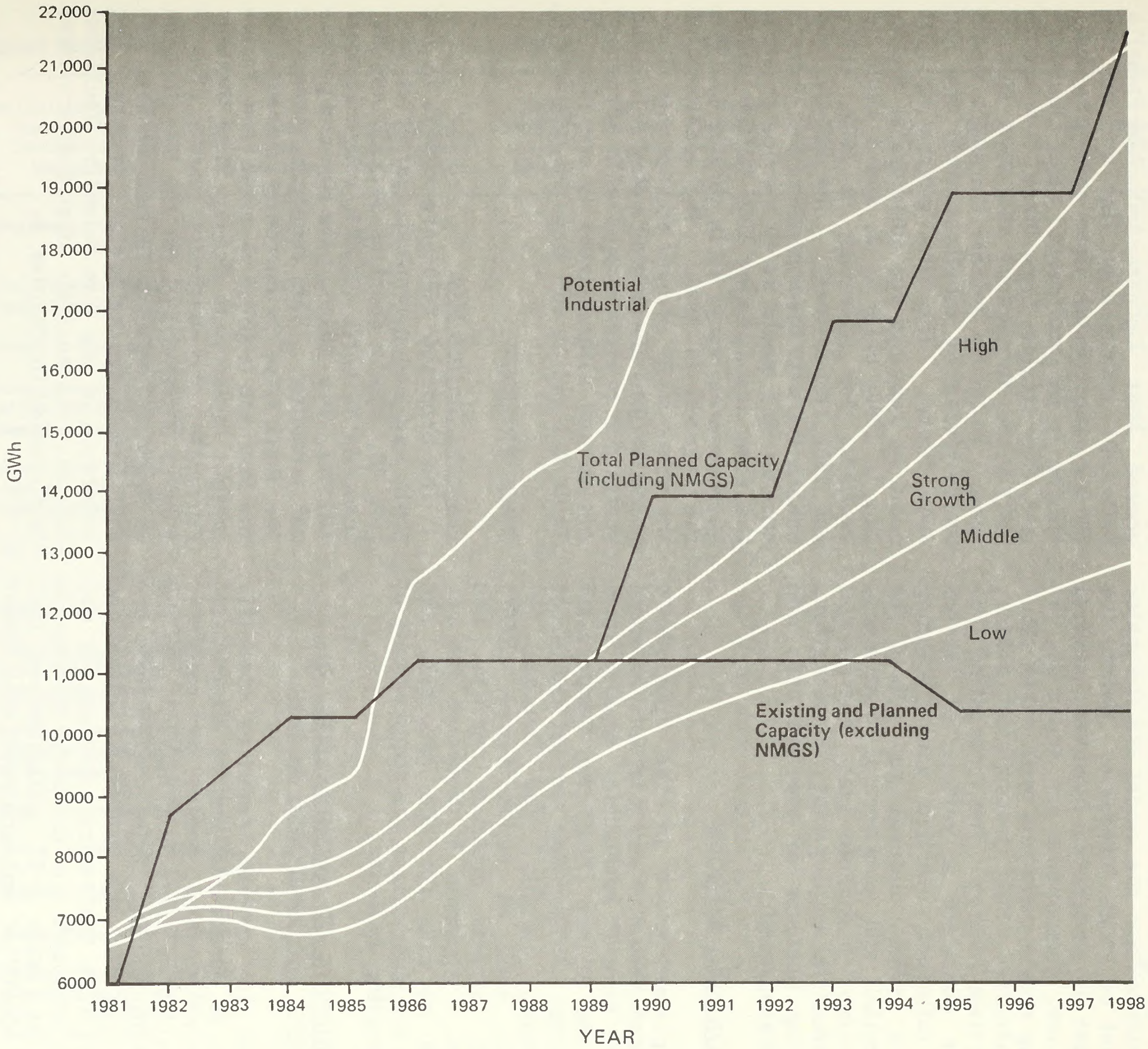


Figure 1-1. SUMMARY OF PNM FORECAST SCENARIOS AND PLANNED CAPACITY ADDITIONS (total requirements, GWh)

the models have been used to compute the total energy sales for each category for each year, the peak demand for the system is computed using historical load factors for each category.

The total energy sales and peak load projections from the model are the major element of PNM's forecasts. Before the forecast is complete, however, several additional components are added in, including resale contracts with other electric utilities, bulk transmission losses, and system reserve. The forecasting procedure considers a variety of factors that influence electric use, including income levels, natural gas prices for residential and commercial customers, population, household size, commercial and industrial employment, conservation, changing patterns of electric use, and load management.

AUTHORIZING ACTIONS

Implementation of the applicant's Proposed Action or any alternatives would require several authorizing actions from the Lead Agency (BLM) and Cooperating Agencies. Authorizing actions are direct approvals, permits, and licenses required, such as rights-of-way (ROW) grants, stream crossing permits, and others. Appendix F describes the required permits for the proposal, and Table 1-1 summarizes the requirements of Cooperating Agencies.

DESCRIPTION OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

The EIS process requires identification of reasonable project alternatives and environmental, social, and economic evaluation of these alternatives. In the following section, brief descriptions are presented for the Proposed Action and alternatives that were selected for detailed analysis. A summary of these is given in Table 1-2. Alternatives that were identified and analyzed at a lesser level of detail are discussed in Appendix A.

GENERAL DESCRIPTION AND LOCATION OF PROJECT COMPONENTS

The proposed NMGS, at ultimate development, would have four 500-MW generating units. Fuel for the plant would be obtained from surface coal mines (under existing leases) to be developed near the plant site. Most of the power generated by the plant would be transmitted on a 5-mile 500-kV loop connecting to the approved Four Corners-Ambrosia-Pajarito (FC-A-P) transmission line and on two 500-kV transmission lines to a new substation to be constructed near Albuquerque, New Mexico; from there, it would be distributed throughout the PNM service area. Water to operate the plant would be delivered by pipelines from the San Juan River. The first generating unit could be required for commercial operation in 1990; Units 2, 3, and 4 would be available for operation in 1993, 1995, and 1998 respectively. The 500-kV loop connecting with the approved FC-A-P trans mission line would be in service in 1990; the first transmission line to the Albuquerque area would be in service in 1993; the second, in 1998. The locations of the above major project components (Proposed Action) are shown on Map 1-1. Land status for project components (Proposed Action and alternatives) is presented in Table 1-3 and on the maps in Appendix G.

NMGS PROJECT

Proposed Station Site

The proposed 2400-acre site is in the south half and northwest quarter of section 13, and in sections 14, 23, and 24, township 23 north (T23N), range 13 west (R13W), New Mexico base line and principal meridian. This location, known as the Bisti site, is currently managed by the BLM and is about 35 miles from Farmington, in San Juan County, New Mexico. Currently, the southeast quarter of section 13 is withdrawn for the Navajo Land Exchange. PNM's selection of this site and its site selection process are described in the Site Selection Technical Report. An analysis of site alternatives is discussed in Chapter 3.

Number of Units and Completion Schedule

Proposed Action. Four 500-MW units are planned for the Proposed Action, to be completed in 1990, 1993, 1995, and 1998. According to the applicant, significant economic benefits would be derived by utilizing common facilities for water, fuel, and pollution control.

Table 1-1. POTENTIALLY REQUIRED PERMITS, APPROVALS, NOTIFICATIONS, AND CONSIDERATIONS FOR PROPOSED ACTION AND ALTERNATIVES

Responsible Agency	Potentially Applicable Permits, Approvals, Notifications, and Considerations	Power Plant Facilities	Water Supply		Intake Structure & Pipe-Line P1	Intake Structure & Pipe-Line P2	Intake Structure & Pipe-Line P3	Trans-mission Line T1	Trans-mission Line T2	Trans-mission Line T3	Trans-mission Line T4	Reser-voir R1	Reser-voir R2
			Surface Water	Ground Water									
Joint Responsibility: U.S. EPA and NMEID	PSD Permit	X											
U.S. EPA	New Source Performance Review Notification	X											
NMEID	Permit to Construct	X											
U.S. Bureau of Reclamation	Contract with Secretary of Interior for Navajo Reservoir Water		X										
	Secretary of Interior Approval of Use for Contracted Water		X										
Army Corps of Engineers	404 Permit				X	X	X						
U.S. EPA	NPDES Permit	X			X	X	X						
New Mexico State Engineer	Permit to Appropriate the Underground Waters of the State of New Mexico			X									
	Permit to Appropriate the Surface Waters of the State of New Mexico											X	X
	Point of Diversion Permit				X	X	X						
NMEID	Notice of Intent to Discharge	X			X	X	X						
	Discharge Plan				X	X	X						
	Sewage Treatment Design Review	X											
U.S. Department of Interior	Emergency Procedures for Consideration of Historic and Cultural Properties Discovered during Construction	X		X	X	X	X	X	X	X	X	X	
New Mexico State Highway Department	Permit to Install Utility Facilities within Public ROW				X	X	X	X	X	X	X		

Table 1-1. POTENTIALLY REQUIRED PERMITS, APPROVALS, NOTIFICATIONS, AND CONSIDERATIONS FOR PROPOSED ACTION AND ALTERNATIVES (continued)

Responsible Agency	Potentially Applicable Permits, Approvals, Notifications, and Considerations	Power Plant Facilities	Water Supply Surface Water	Water Supply Ground Water	Intake Structure & Pipe-Line P1	Intake Structure & Pipe-Line P2	Intake Structure & Pipe-Line P3	Trans-mission Line T1	Trans-mission Line T2	Trans-mission Line T3	Trans-mission Line T4	Reser-voir R1	Reser-voir R2
Bureau of Land Management	ROW Grant, Sale, Lease, or Exchange	X											
	ROW Grant and Temporary Use Permits (Note: BLM as Lead Agency has Responsibility for NEPA Compliance,[a]			X	X	X	X	X	X	X	X		
	Including Protection of Wetlands [Exec. Order 11990],		X		X	X	X						
	Floodplain Management [Exec. Order 11988])		X		X	X	X						
	Section 7 Compliance[a] (End. Species Act and New Mexico Wildlife Conservation Act)	X	X	X	X	X	X	X	X	X	X	X	X
	Section 106 Compliance[a]	X		X	X	X	X	X	X	X	X	X	X
	Compliance with Exec. Order 11593[a] (Protection and Enhancement of the Cultural Environment)	X		X	X	X	X	X	X	X	X		
	Noncompetitive Sale of Mineral Materials	X			X	X	X	X	X	X	X		
	Permit for Firewood										X		
Bureau of Indian Affairs	Tribal, BIA, and Secretary of Interior Approval of Rights-of-Way				X	X	X	X	X		X		
U.S. Forest Service	Special Use Authorization										X		
Federal Aviation Administration	Notice of Proposed Construction or Alteration of Objects Affecting Navigable Airspace	X											
	Notice of Proposed Construction or Alteration, Activation, Deactivation, or Other Change in Airport Status	X											
Federal Communications Commission	Private Operational Microwave Service License				X	X	X						

Table 1-1. POTENTIALLY REQUIRED PERMITS, APPROVALS, NOTIFICATIONS, AND CONSIDERATIONS FOR PROPOSED ACTION AND ALTERNATIVES (concluded)

Responsible Agency	Potentially Applicable Permits, Approvals, Notifications, and Considerations	Power Plant Facilities	Water Supply		Intake Structure & Pipe-Line P1	Intake Structure & Pipe-Line P2	Intake Structure & Pipe-Line P3	Trans-mission Line T1	Trans-mission Line T2	Trans-mission Line T3	Trans-mission Line T4	Reser-voir R1	Reser-voir R2
			Surface Water	Ground Water									
New Mexico Public Service Commission	Certificate of Public Convenience and Necessity	X											
	Location Permit	X											
New Mexico State Land Office	ROW Easements				X	X	X	X	X	X			

[a]Compliance is also the responsibility of other federal agencies such as the Bureau of Indian Affairs and the Forest Service, where applicable.

Table 1-2. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS

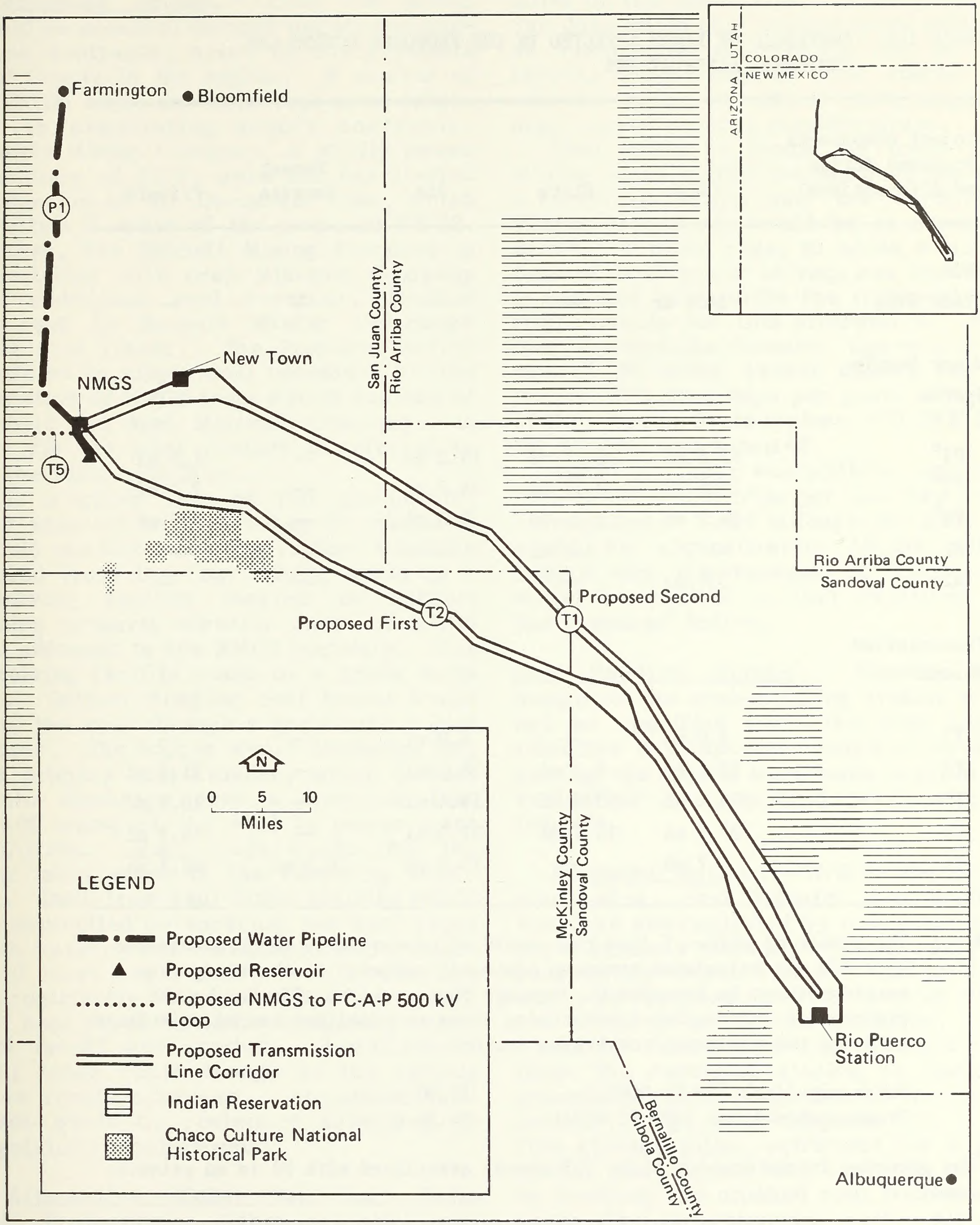
	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
NMGS	Four 500-MW coal-fired units completed 1990-2000	No action (other means of providing for need) Delay of action	No action Delay of action
<u>Project Component</u>			
Site	Bisti	McKinley County Torrance County	McKinley County Torrance County
<u>Fuel Supply System</u>			
Coal supply	Sunbelt and Arch Minerals joint venture	Other San Juan Basin coal producers Coal sources outside San Juan Basin	Other San Juan Basin coal producers
Coal handling	Trucked to NMGS site, conveyor belt to active and emergency storage piles on-site	Coal transported by conveyor belt to site and then to power plant Off-site storage of run-of-mine coal	Coal transported by conveyor belt and then to power plant Off-site storage of run-of-mine coal
<u>Pollution Control Systems</u>			
Particulate removal	Fabric filter	Electrostatic precipitator	Electrostatic precipitator
SO_2 control	One of the following: • Wet limestone scrubbing • Alkali spray-drying	Wet limestone scrubbing, lime spray-drying, dry types, regenerable types	None
NO_x control	One of the following: • Dual-register burner • Tangentially fired steam generation • Controlled-flow/split-flame burner	Low NO_x boiler design, flue gas recirculation	None

Table 1-2. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (continued)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Solid waste disposal	Return to coal mine for layered disposal	Marketing of fly ash for commercial products	None
		Random dumping in mined-out pits	
		Off-site landfill	
		On-site landfill	
Heat Rejection System	Wet-type cooling towers	Wet-dry cooling towers	Wet-dry cooling towers
		Once-through cooling	
		Cooling ponds	
		Natural-draft cooling towers	
		Dry mechanical-draft cooling towers	
Water Supply System			
Water supply sources	35,000 acre-feet/year (ac-ft/yr) from San Juan River	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from well field	20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from well field
		20,000 ac-ft/yr from San Juan River (if wet/dry-cooling towers)	20,000 ac-ft/yr from San Juan River (wet/dry-cooling towers)
		35,000 ac-ft/yr from well field	
		35,000 ac-ft/yr from uranium mine dewatering	
		20,000 ac-ft/yr from San Juan River and 15,000 ac-ft/yr from uranium mine dewatering	

Table 1-2. SUMMARY OF ALL PROJECT COMPONENT ALTERNATIVES CONSIDERED AND THOSE SELECTED FOR ANALYSIS (concluded)

Project Component	Proposed Action	Alternatives Considered	Alternatives Selected for Analysis
Surface-water diversion (intake)	Near Farmington	Near Bloomfield	Near Bloomfield
Water supply pipeline	Alignment paralleling NM Highway 371 (P1), originating at Farmington	P2 alignment paralleling existing pipeline ROW (El Paso Natural Gas), originating near Bloomfield P3 also originating near Bloomfield	P2, P3
Reservoir	2 miles south of NMGS site, T23N, R13W, Section 36 (R1)	R2 approximately 3 miles southeast of proposed NMGS site	R2
<u>Transmission System</u>			
Transmission Lines	T5, T2, T1	T3, T4	T3, T4
Station	Rio Puerco	None	None



Note: For more information, see the location maps in Appendix G.

Source: BLM 1982.

Map 1-1. GENERAL LOCATION OF PROPOSED ACTION

Table 1-3. OWNERSHIP OF LANDS AFFECTED BY THE PROPOSED ACTION AND COMPONENT ALTERNATIVES

Project Components (Proposed Action and Alternatives)	BLM	State	BIA	Forest Service	Private
NMGS					
Plant Site	2400 ac	--	--	--	--
Water Supply System					
P1[a]	23.6 mi	0.37 mi	14.2 mi	--	1.3 mi
P2[b]	14.6 mi	0.37 mi	24.8 mi	--	2.7 mi
P3[b]	36.2 mi	7.2 mi	0.3 mi	--	2.1 mi
R1	--	640 ac	--	--	--
R2	320 ac	--	--	--	--
Transmission System[c]					
T5	1.0 mi	--	4.0 mi	--	--
T2	33.6 mi	6.3 mi	38.6 mi	--	21.2 mi
T1	64.4 mi	11.9 mi	19.4 mi	--	10.9 mi
T3	37.3 mi	13.1 mi	37.9 mi	--	16.3 mi
T4	4.7 mi	--	39.8 mi	10.3 mi	60.3 mi

Note: The number of miles of land that would be traversed by the transmission line ROW was calculated assuming placement centered in the study area corridor shown in Appendix G. Acreage that would be affected by the proposed or alternative transmission lines or pipelines can be calculated by using the following conversion factors:

Water pipelines (90-ft ROW): 10.90 ac/mi
Transmission lines (200-ft ROW): 24.24 ac/mi

[a]The proposed intake pumping plant (35 acres) associated with P1 is on private land.

[b]The alternative intake pumping plant (35 acres) associated with P2 and/or P3 is on private land.

[c]The proposed Rio Puerco Station (109 acres) is on private land.

Fuel Supply System

Coal Supply.

Proposed Action. Coal for NMGS would be acquired through negotiated purchase contracts, based on the available coal supply in the region. A number of potential suppliers have expressed interest in negotiating supply contracts. Sunbelt Mining Company, a wholly owned subsidiary of PNM, owns and has started production at the De-na-zin Mine, which is within 2 miles of the proposed NMGS. Further, the Sunbelt Mining Company is negotiating with Arch Minerals Company for additional coal reserves, located adjacent to Sunbelt Mining Company's Bisti coal leases. The Proposed Action would be to supply coal necessary for the operation of NMGS from a joint venture of Sunbelt and Arch Minerals Company. In this EIS the joint venture is referred to as the Bisti coal mine.

In a given year of full production, four separate mine pits may be needed to supply the necessary coal. Coal would be hauled from the four mining areas to a receiving facility located on Sunbelt Mining property directly north of NMGS and adjacent to the NMGS boundary. This receiving facility would be a truck dump pit. Bottom-dumping coal trucks would drop the coal through a grate into a coal hopper. The hopper would discharge into the primary coal crusher, which in turn would discharge onto a conveyor that would transport the coal to power plant facilities. Haul roads would link the four mine areas to the receiving facility. Dust from haul-truck activity would be controlled by spraying the haul roads with water. Water consumption for haul-road dust suppression would average approximately 122 acre-feet per year. The haul roads would be designed to control runoff and erosion. Locations of haul roads would change as the various mine fronts advanced. Abandoned haul roads would be reclaimed according to regulatory requirements.

Alternative (Other San Juan Basin Coal Producers). Other potential coal producers in the San Juan Basin have expressed interest in supplying coal to the NMGS. These potential coal sources would be capable of supplying large quantities of coal having properties essentially the same as Bisti coal. There is an estimated 4 billion tons of strippable subbituminous coal reserves within 30 miles of the NMGS site. Other potential San Juan Basin coal sources were selected as reasonable alternatives to be assessed, since another coal source (or sources) in the vicinity of NMGS might be used, based on cost considerations.

Coal would be hauled by truck from mining areas within the San Juan Basin to a receiving facility near the NMGS site. Mining procedures would be as described above. A worst case, in which 9 million tons of coal would be required annually, is assumed to describe the transportation requirements for this alternative. Further assumptions include: one-way haulage of 30 miles (worst case), 120-ton trucks, 250 haul days per year. The use of New Mexico State Highway 371 (NM 371) for hauling was assumed.

Based on these assumptions, approximately 300 round trips per haul day would be required. Total mileage per haul day would be approximately 18,000 miles. Design and maintenance of haul roads would be similar to that described for the Proposed Action.

Coal Handling System.

Because final design of the coal-handling system would not be specified until the coal supply selection is completed, assumptions concerning the system were made to allow the evaluation of expected environmental impacts.

Proposed Action. Within the power plant area, coal transfer and handling would be accomplished by a covered conveyor system. Primary crushed coal, approximately 4-inch diameter and smaller, would be received directly north of NMGS and adjacent to the site boundary. Coal would be transferred via conveyor belt from the receiving station to enclosed secondary crushers and then to four open, active storage piles (Figure 1-2). Active storage piles, sufficient for 3 days of full plant operation, would be formed by dropping the crushed coal from a conveyor through a lowering well. All coal handling and processing after active storage would be enclosed, for dust control. Coal from active storage piles would be conveyed to the plant coal silos (above the pulverizers). It would be fed from storage silos into the pulverizers

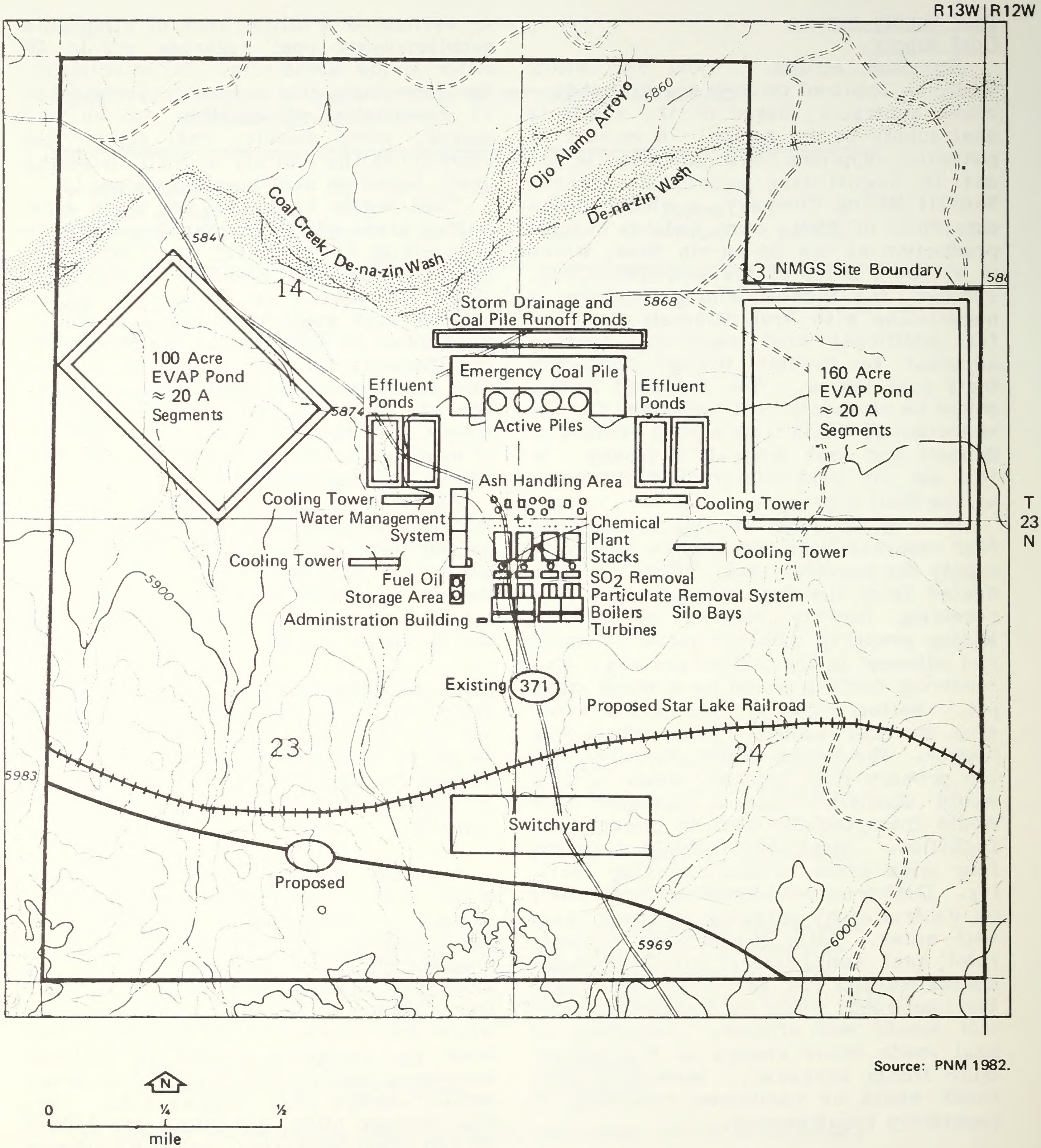


Figure 1-2. STATION LAYOUT

upon demand, and the pulverized coal would be air-forced to burners in the boilers.

Primary crushed and screened coal would be used to develop emergency storage piles, sufficient for operation of on-line units at 80 percent of capacity for 90 days. The emergency piles would be formed and compacted with conventional mining and road construction equipment. The surfaces of these piles would be treated with a surface stabilizer and would not be trafficked after formation. Should the emergency piles be tapped, coal would be transferred by self-loading scrapers or other conventional bulk materials handling equipment to the secondary crushers and from there to the active storage piles and reclaim feeders, and then through the fuel cycle. All storage piles and coal-processing areas would be designed so that runoff from precipitation would be diverted to runoff evaporation basins lined with an impervious material or would be discharged into local streams/arroyos as appropriate and allowed under NPDES standards. Discussion of possible discharges past the plant boundaries under precipitation events exceeding a 10-year, 24-hour storm is presented in the Water Quality Technical Report. The foundation beneath on-site coal stockpiles would be prepared to control percolation.

Coal spills from any plant conveyor would be removed promptly by front-end loader and truck, or manually. This coal would be returned to the proper area for subsequent reclaiming.

Coal blending would not be required. Random blending would result from concurrent working of four mine areas and from the routine in-plant operations associated with handling and stockpiling the coal. Plant fuel and emission control systems would be designed to use unblended run-of-mine San Juan Basin coals.

<u>Alternative 1 (Conveyor Delivery to Plant Site)</u>. Primary crushed coal could be delivered from the mine to the receiving station by conveyor. If conveyors were used, unloading hoppers would be eliminated at the station and coal would be transferred directly to the plant conveyor and storage piles.

<u>Alternative 2 (Off-Site Storage of Run-of-Mine Coal)</u>. An alternative to on-site storage of primary crushed emergency coal would be storage of compacted run-of-mine coal on Sunbelt Mining Company property north of the NMGS site. Reclaim of this coal would be by earthmoving equipment to the mine truck dump pit and primary crusher.

<u>Pollution Control Systems</u>

<u>Particulate Removal</u>.

<u>Proposed Action</u>. The applicant proposes to use fabric filters for particulate removal at the proposed NMGS. Selection of a fabric filter would be closely coupled to the sulfur dioxide (SO_2) control system and other plant environmental systems. Fabric filters are capable of removing particulate matter at high efficiencies and of meeting applicable federal and state regulations for particulates.

<u>Alternative</u>. An alternative to using fabric filters for particulate removal would be to use electrostatic precipators (hot-side or cold-side). Electrostatic precipitators are also capable of high particulate-removal efficiency and of meeting applicable federal and state regulations. At the present time, use of electrostatic precipitators for particulate removal at large utility units is the most widely used technique.

<u>SO_2 Control</u>. The applicant proposes to use one of the following two possible SO_2 removal techniques at the proposed NMGS. Both of these SO_2 control systems are capable of consistently attaining an average removal efficiency of 80 percent, if required to meet New Mexico state emission limits.

<u>Wet Limestone Scrubbing</u>. Wet limestone scrubbing is currently the most common method of SO_2 control for treatment of utility boiler combustion gases. In this system, limestone ($CaCO_3$) additive is crushed, slurried with water, and used as an alkaline spray to absorb SO_2 from the flue gas.

<u>Alkali Spray-Drying</u>. The spray absorber process is a relatively recent development in combustion gas cleaning technology. It is a two-stage SO_2 and particulate removal process that uses a spray absorber/dryer for SO_2 removal,

followed by a particulate removal device to collect the solid scrubber reaction products and the fly ash in the flue gas stream.

Nitrogen Oxides (NO_x) Control. The applicant proposes to use one of the following three possible NO_x removal techniques at the proposed NMGS. Any of these three NO_x control techniques is capable of meeting the current New Mexico NO_x standards.

Dual-Register Burner. A dual-register burner is used to reduce NO_x emissions to the present regulation level. The burner design incorporates an inner and outer burner register that controls the mixing of fuel and air, thereby controlling NO_x emissions.

Tangentially Fired Steam Generator. A tangentially fired steam generator is designed so that the entire furnace area acts as a single burner, allowing fuel-rich and air-rich streams to be blended for complete combustion of the fuel. This design is inherently low in NO_x formation.

Controlled-Flow/Split-Flame Burner. This system uses a series register arrangement that divides the secondary air into two concentric streams. The two registers control the mixing rate between the primary and secondary air streams and the rate of entrainment of the furnace gases, thereby controlling NO_x emissions.

Solid Waste Disposal. Four types of wastes would be derived from coal used in NMGS: bottom ash, fly ash (including economizer ash), coal pulverizer rejects, and flue gas desulfurization (FGD) by-product. On a quantitative basis, the wastes associated with the coal burning process would be the largest, including coal preparation (pulverizing) and desulfurization of the combustion gases. On a volumetric basis, the estimated average production of coal-derived wastes would be about 1475 acre-feet per year (ac-ft/yr) with four units operating, or 59,000 ac-ft over a 40-year plant life.

It is proposed that these solid wastes be disposed of by layering them in previously mined portions of the coal source mines. The wastes would be hauled from NMGS to the coal mines by end-dump trucks.

Heat Rejection System
Proposed Action: Wet-Type Cooling Towers (Evaporative Cooling/Forced-Draft Cooling Towers). The Proposed Action would be to construct a heat rejection system based on evaporative cooling and to use forced-draft cooling towers. The system would be designed to operate satisfactorily during all normal and foreseeable emergency conditions. Cooling-tower makeup water would be drawn from the nearby raw water storage reservoir. This water may require pretreatment prior to cooling-system use. The makeup water would replace the tower losses from evaporation, drift, and blowdown.

As water evaporates from a closed-cycle cooling system, dissolved and suspended substances become increasingly concentrated in the remaining recirculating water. To limit concentrations, a portion of the recirculating water would be withdrawn continuously. The discharged cooling water, termed "blowdown," would be replenished by makeup water to maintain a constant quantity of water in the system.

Typical blowdown ranges for a 500-MW unit wet tower would be 100 to 300 gallons per minute. Cooling-tower blowdown probably would be treated and recycled as necessary to achieve zero discharge.

Alternative: Wet/Dry Cooling Towers (Hybrid Wet/Dry System). This alternative consists of a water-cooling system employing both dry and conventional wet towers. A combination of wet- and dry-cooling towers would require less than 25 acres of land area and would require additional aboveground hardware items over what wet-cooling towers alone would require. The wet towers would be designed to operate mainly during the summer and the dry towers to operate mainly during cold weather.

WATER SUPPLY SYSTEM

The water requirement for NMGS, with four units operating at rated capacity, would be 35,000 ac-ft/yr. This requirement is based on the proposed heat rejection system using wet-cooling towers. The applicant is currently trying to

complete arrangements to obtain 20,000 ac-ft/yr. Alternatives using 20,000 and 35,000 ac-ft/yr are described below.

Water Supply Source

For a detailed discussion of water supply source alternatives, see the Hydrology Technical Report.

Proposed Action. The applicant proposes to use 35,000 ac-ft/yr of water from the San Juan River (Navajo Reservoir) by acquiring an allocation of contract water or negotiating for use of allocations. The applicant is currently negotiating a commitment to use 20,000 ac-ft/yr of Navajo Reservoir water from an existing industrial contract holder. The applicant is also negotiating for additional use of San Juan River water (approximately 15,000 ac-ft/yr).

Alternative 1 (20,000 Ac-Ft/Yr from San Juan River, 15,000 Ac-Ft/Yr Ground Water). Paragon Resources, a subsidiary of PNM, has applied to the New Mexico State Engineer for rights to 40,000 ac-ft/yr of ground water to be developed from wells in the vicinity of NMGS. If the use of more than 20,000 ac-ft/yr of San Juan River water cannot be acquired, the applicant would develop a well field in the vicinity of NMGS to supply an additional 15,000 ac-ft/yr for the proposed wet-cooling system.

The wells would extract water from the Westwater Canyon Member of the Morrison Formation, about 4000 to 6000 feet below the ground surface in the project vicinity. Preliminary estimates indicate that potential well yields would be 100-1000 gallons per minute.

The Paragon Resources application for rights to ground water specifies 16 locations for wells in the vicinity of NMGS. The wells would be widely spaced, so collecting pipeline systems and new access roads would be necessary to develop a water supply from this source. Application for access roads and collection systems has been made to the BLM Albuquerque District Office.

Alternative 2 (20,000 Ac-Ft/Yr from San Juan River). This alternative consists of the use of 20,000 ac-ft/yr (from the San Juan River) in conjunction with the wet- and dry-cooling system alternative.

Surface Water Diversion (Intake)

The applicant has investigated the technical and administrative feasibility of diverting water from the San Juan River. Two locations appear favorable: the Proposed Action, in the vicinity of Farmington; and an alternative, near the State Highway 44 (NM 44) bridge crossing at Bloomfield (Map 1-2).

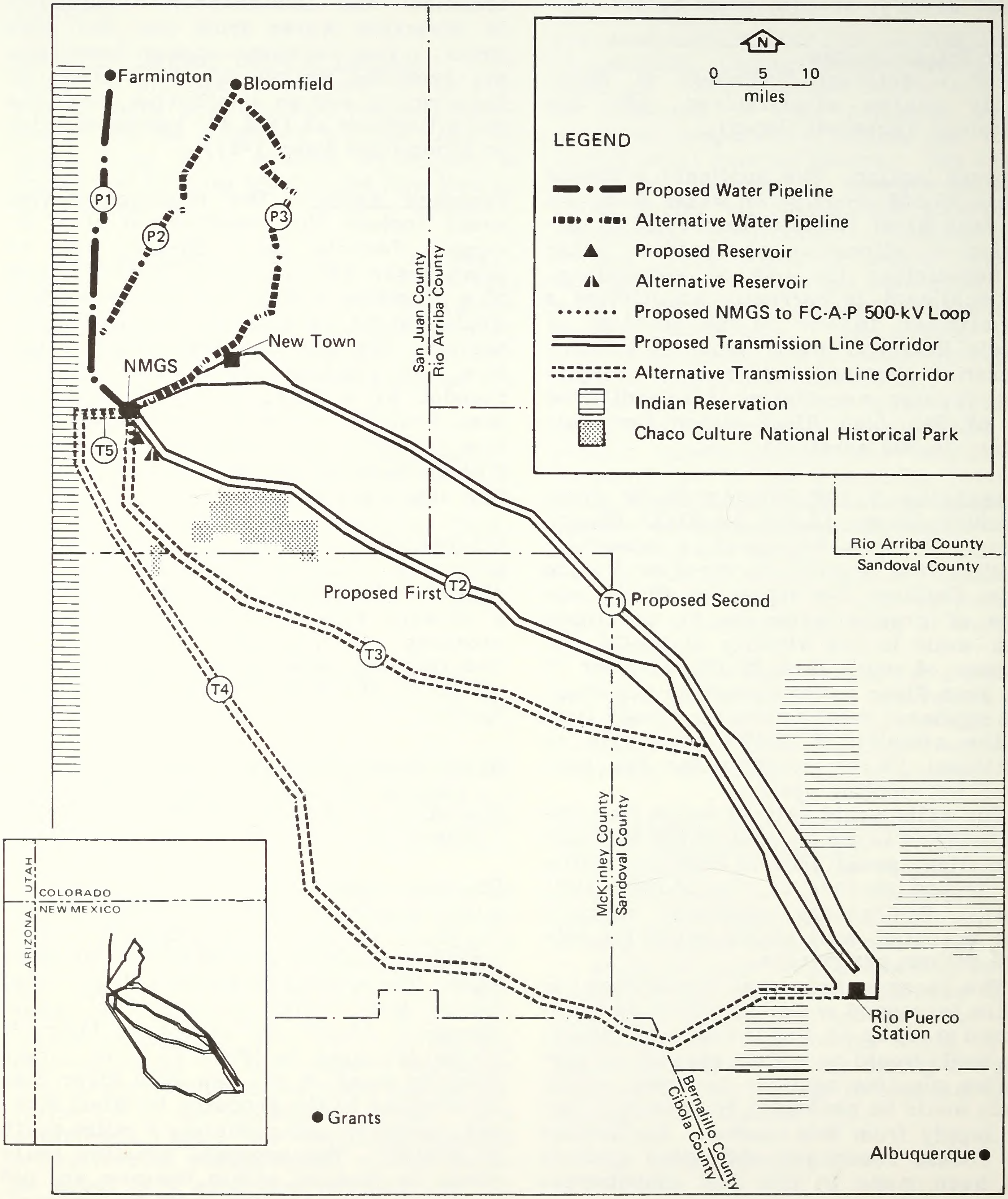
Proposed Action. The Proposed Action would include the construction of a diversion facility on a 35-acre site to pump water from the river. Construction of a diversion weir in the San Juan River would not be necessary. For flood protection, the site for the intake structure and pumping plant would be surrounded by a dike, or the entire plant area would be filled to above flood level (i.e., above the 100-year floodplain). Site dewatering pumps would be required if a dike were built.

Alternative. In the 100-year floodplain, an alternative location for river diversion facilities would be located on a 35-acre site near the NM 44 bridge crossing at Bloomfield (Map 1-2). Construction and design specifications would be the same as for the Proposed Action.

Water Supply Pipeline System

Details of construction methods and operation of this system are described in Appendix B.

Proposed Action (P1). Two 42-inch main water pipelines would be needed to carry 35,000 ac-ft/yr, as is proposed. Both pipelines would be placed within the same ROW. The approximately 40-mile proposed initial main water pipeline (P1) would transport 16,000 to 18,000 ac-ft/yr of water (starting in 1990) from an intake pumping plant on the San Juan River near Farmington to the proposed terminal storage reservoir approximately 2 miles south of NMGS. The proposed pipeline route would be located within the new and old portions of the NM 371 ROW for approximately 75 percent of its length. An intake pumping plant and three booster pump stations would lift the water to the high point of the proposed pipeline route near Moncisco Mesa (Milepost [MP] 17 in Appendix G maps). From there the water



Note: For more information, see the location maps in Appendix G.

Source: BLM 1982.

Map 1-2. GENERAL LOCATION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION

would flow by gravity to the storage reservoir near NMGS.

The proposed initial main water pipeline would supply water for NMGS Units 1 and 2. A second main water pipeline would be constructed in 1995 for NMGS Units 3 and 4. This second pipeline would start at the first intermediate pump station site (MP 0.8 of the first main water pipeline route) and would terminate at the storage reservoir near NMGS. The second main water pipeline would have a capacity to transport 16,000 to 18,000 ac-ft/yr of water for NMGS Units 3 and 4.

Alternative P2. This approximately 43-mile alternative main water pipeline route would initiate from an intake pumping plant on the San Juan River near Bloomfield and would terminate at the proposed terminal storage reservoir near NMGS. This alternative pipeline route would follow a southerly course for about a half-mile through a suburban residential area and then join an existing pipeline ROW (El Paso Natural Gas). The alternative pipeline route would cross and then generally parallel this ROW on the southern side to the crossing of old NM 371 (north of Bisti Trading Post), where it would join the proposed main water pipeline route at MP P1-29.5. P2 would parallel an existing ROW for about 85 percent of its total length. The last 10 miles of this alternative route is the same as the proposed main water pipeline route (P1). Approximately 19 miles of Navajo Indian Irrigation Project (NIIP) lands would be crossed by this alternative route; the Main Irrigation Conveyance System Canal and the future Burnham Pump Lateral would be crossed at MP P2-11 and MP P2-25, respectively. No new access roads would be required for construction of the four intermediate pump stations associated with this alternative. An intake pumping plant and four intermediate pump stations would be required to transport the approximately 16,000 to 18,000 ac-ft/yr of water (starting in 1990) required for NMGS Units 1 and 2. As with the proposed main water pipeline, a second main water pipeline (running parallel and adjacent to the initial pipeline) would be constructed at a later date (1995 completion date) for NMGS Units 3 and 4. Incremental increases in the amount of water to be transported by the second pipeline would be the same as for the proposed main water pipeline.

Alternative P3. This approximately 49-mile alternative would also start from an intake pumping plant on the San Juan River near Bloomfield and would also terminate at the proposed terminal storage reservoir near NMGS. This alternative pipeline route is in common with main water pipeline alternative P2 for the first mile or so, and then it crosses over to the east side of NM 44. At approximately MP P3-20 this route alternative crosses back over NM 44 and then runs almost due south for approximately 8 miles, at which point it turns southwest and continues to the proposed terminal storage reservoir near NMGS. P3 would parallel an existing ROW for about 46 percent of its total length. This route alternative would avoid crossing the NIIP system, although it would cross over the Main Irrigation Conveyance System Tunnel 4. This alternative would traverse the Kutz Canyon Badlands between MP P3-9 and P3-16, and the Angel Peak Recreation Area between MP P3-14 and P3-18. An intake pumping plant and four intermediate pump stations would be required to transport the approximately 16,000 to 18,000 ac-ft/yr of water (starting in 1990) required for NMGS Units 1 and 2. This pipeline would operate by gravity from the summit, at about MP P3-32.0, to the terminal storage reservoir. As with the proposed main water pipeline, a second main water pipeline (running parallel and adjacent to the initial pipeline) would be constructed at a later date (tentative 1995 completion date) for NMGS Units 3 and 4. Incremental increases in the amount of water to be transported by the second pipeline would be the same as for the proposed main water pipeline.

Water Storage Reservoir

Proposed Action. The water storage reservoir (R1) would compensate for minor differences between the plant water demand and deliveries from the water supply system during normal plant operations. It would also provide a backup supply for the power plant during scheduled and unscheduled interruptions of service from the water supply system. The proposed

reservoir would be located about 2 miles south of NMGS, in the northeastern part of Sec. 36, T23N, R13W, as indicated on Map 1-3.

Alternative. An alternative reservoir site (R2) is located in Sec. 6, T22N, R12W, approximately 1 mile southeast from the proposed site. This location is considered a reasonable alternative if the proposed site is found unsatisfactory after detailed investigations required for design and evaluation.

TRANSMISSION SYSTEM

Transmission Lines

Transmission capacity for the first unit would be provided by a 5-mile 500-kV loop (T5). The two proposed 500-kV lines comprising the loop would be constructed in parallel within a half-mile corridor. This route would be approximately 5 miles long and would be corridorized with the new route of NM 371.

Four possible route alternatives are considered technically and economically feasible for construction of the rest of the 500-kV transmission system (see Map 1-2). These alternatives have been selected to avoid areas of known land use conflicts and to consider reasonable routes of access between NMGS and the proposed Rio Puerco Station. Route T2 is proposed for construction of the first 500-kV transmission line. Route T1 is proposed for the second line from NMGS to Rio Puerco Station. Routes T3 and T4 are the two alternative 500-kV transmission line routes from NMGS to Rio Puerco Station. The proposed and alternative transmission line system is summarized in Table 1-4 (refer to the Project Description Technical Report for more detail).

Rio Puerco Station

In order to integrate the proposed transmission lines into the existing New Mexico extra-high voltage (EHV) system, PNM proposes to develop a new 500/345-kV transformer, switching, and distribution station in the Albuquerque area, to be called the Rio Puerco Station. The proposed Rio Puerco Station (approximately 10 miles northwest of Rio Rancho, New Mexico) would provide the southern terminus of the 500-kV transmission line system.

Land Requirements

The land requirements for construction and operation of the proposed and alternative 500-kV lines and associated stations are shown in Table 1-4. Land status for the proposed and alternative lines is detailed on the maps in Appendix G.

Structures and Towers

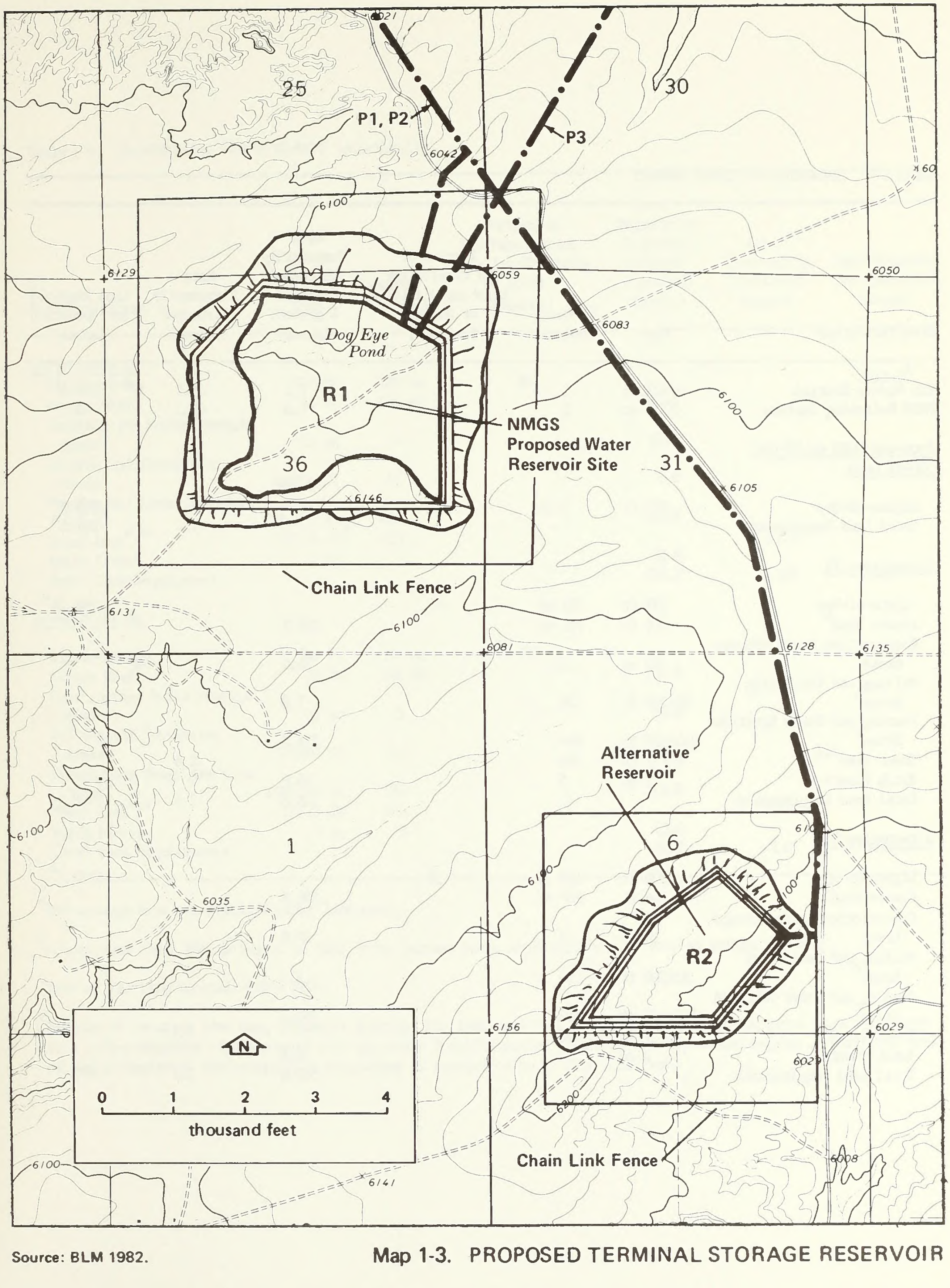
Proposed Action. Three general types of tower structures would be used for the proposed 500-kV transmission lines: tangent (guyed vee tower), angle and dead end (self-supporting lattice steel) (Figure 1-3). Towers would be located to avoid archaeological sites and other environmentally sensitive areas (identified through BLM survey procedures); span lengths would be adjusted to avoid these areas where practical. Placement of structures within floodplains would be minimized to the fullest extent possible, and in most areas it would be possible to span the floodplain.

Alternative. In addition to the structures described above, an alternative guyed steel structure is being evaluated for use for the NMGS-to-Rio Puerco 500-kV transmission system (Figure 1-3). If selected, guyed delta steel structures would be used for tangent applications only, and then only in areas of nonconflicting land use. Other structure alternatives to be evaluated are self-supporting lattice steel, tubular-steel H-frame, and tubular-steel delta H-frame (Figure 1-4).

WORK FORCE AND SCHEDULE

The applicant estimates that a 14-year period (1985-1998) would be required for site preparation and construction of NMGS Units 1 through 4. Approximately 12 months would be required for construction of the first proposed transmission line and 13 months would be required for construction of the second proposed transmission line. Construction of each intake structure, water pipeline, pumping plants, and storage reservoir would be completed over a 2-year period.

Construction and operation labor requirements for the station facilities, water supply system, and transmission system are shown in Table 1-5. The applicant estimates that 20 to 60 percent



Source: BLM 1982.

Map 1-3. PROPOSED TERMINAL STORAGE RESERVOIR

Table 1-4. TRANSMISSION SYSTEM SUMMARY

Area/Facilities	Size	Number/ Distance	Portion of ROW Paralleling Existing Utilities or Roads (percent)	Area Temporarily Disturbed (cleared & graded) (acres)	Area Permanently Disturbed (acres)	Land Required for Operation (acres)
Rio Puerco Station	109.2 ac	1		7.1	45.7	109.2
NMGS Switching Station	37.9 ac	1		7.0	40.3	40.3
<u>Proposed NMGS to FC-A-P 500-kV Loop</u>						
Rights-of-Way	200 ft	5 mi	100			121.2[a]
Total Land Requirements					<1	121.2[a]
<u>Alternative T2</u>						
Rights-of-Way	200 ft	101 mi	91			2448.24[a]
Access Road[b]	14 ft	101 mi		200.2		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	34		7.8		
Framing and Tower Erection Sites[c]	150x200 ft	404		278.8		
Tower Area[c,d]	177.7 ft^2	404			1.6	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				526.8	1.6	2448.24
<u>Alternative T1</u>						
Rights-of-Way	200 ft	107 mi	32			2593.7[a]
Access Road[b]	14 ft	107 mi		206.4		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	36		8.3		
Framing and Tower Erection Sites[c]	150x200 ft	428		295.3		
Tower Area[c,d]	177.7 ft^2	428			1.7	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				550.0	1.7	2593.7

Table 1-4. TRANSMISSION SYSTEM SUMMARY (concluded)

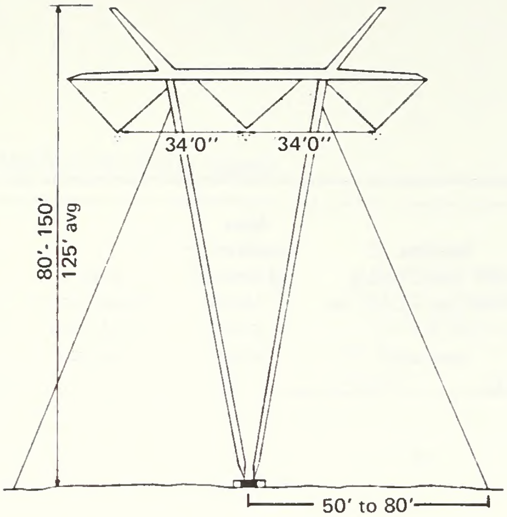
Area/Facilities	Size	Number/ Distance	Portion of ROW Paralleling Existing Utilities or Roads (percent)	Area Temporarily Disturbed (cleared & graded) (acres)	Area Permanently Disturbed (acres)	Land Required for Operation (acres)
Alternative T3						
Rights-of-Way	200 ft	105 mi	36			2545.2[a]
Access Road	14 ft	105 mi		202.5		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	35		8.0		
Framing and Tower Erection Sites[c]	150x200 ft	420		289.8		
Tower Area[c,d]	177.7 ft^2	420			1.68	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				540.3	1.68	2545.2
Alternative T4						
Rights-of-Way	200 ft	126 mi	70			3054.2[a]
Access Road[b]	14 ft	126 mi		243.0		
Construction Route Storage Areas	10 ac	3		30.0		
Pulling and Tensioning Areas[c]	50x200 ft	42		9.7		
Framing and Tower Erection Sites[c]	150x200 ft	504		348.0		
Tower Area[c,d]	177.7 ft^2	504			2.0	
Batch Plants	2 ac	5		10.0		
Total Land Requirements				640.7	2.0	3054.2

[a]ROW acreage does not preclude other land uses.

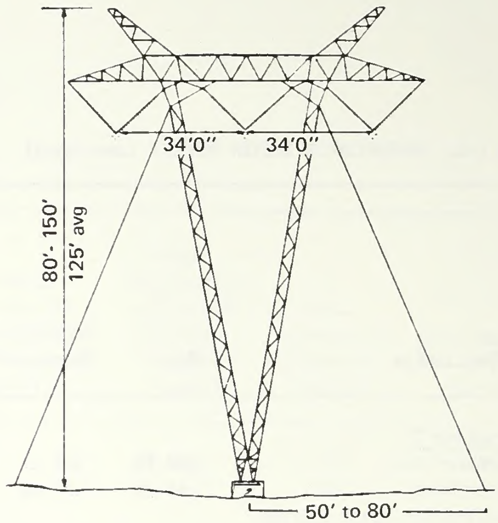
[b]Access road along ROW estimated at 6000 ft/mi (access roads would probably be located within the ROW).

[c]Area or facility located within ROW.

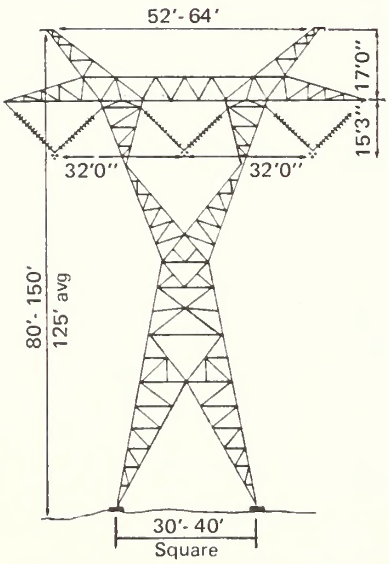
[d]Because of existing land use, primarily grazing, the land area that would be occupied by the guyed towers is based on a 2-foot-diameter circle around each guy and a 5-foot-diameter circle around the center support. The tower area of the estimated 55 self-supporting structures is assumed to be 35 feet x 35 feet.



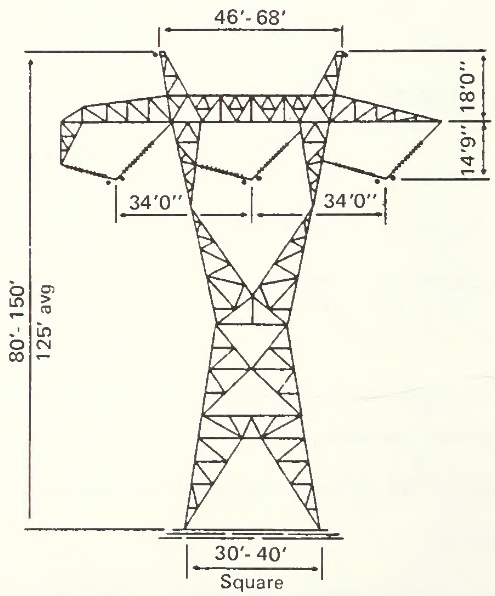
GUYED-VEE TUBULAR-STEEL TOWER



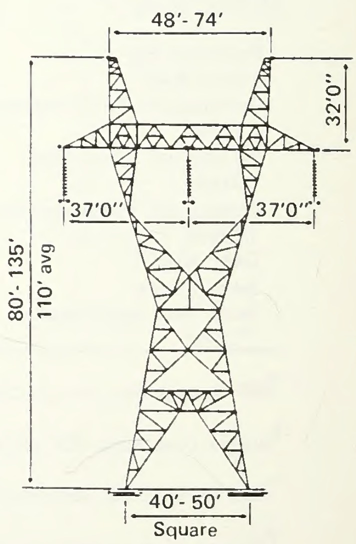
GUYED-VEE LATTICE-STEEL TOWER



SELF-SUPPORTING
LATTICE-STEEL TOWER



LIGHT-ANGLE
LATTICE-STEEL TOWER



HEAVY-ANGLE LATTICE-STEEL
DEAD-END TOWER

Figure 1-3. 500 kV STRUCTURE TYPES

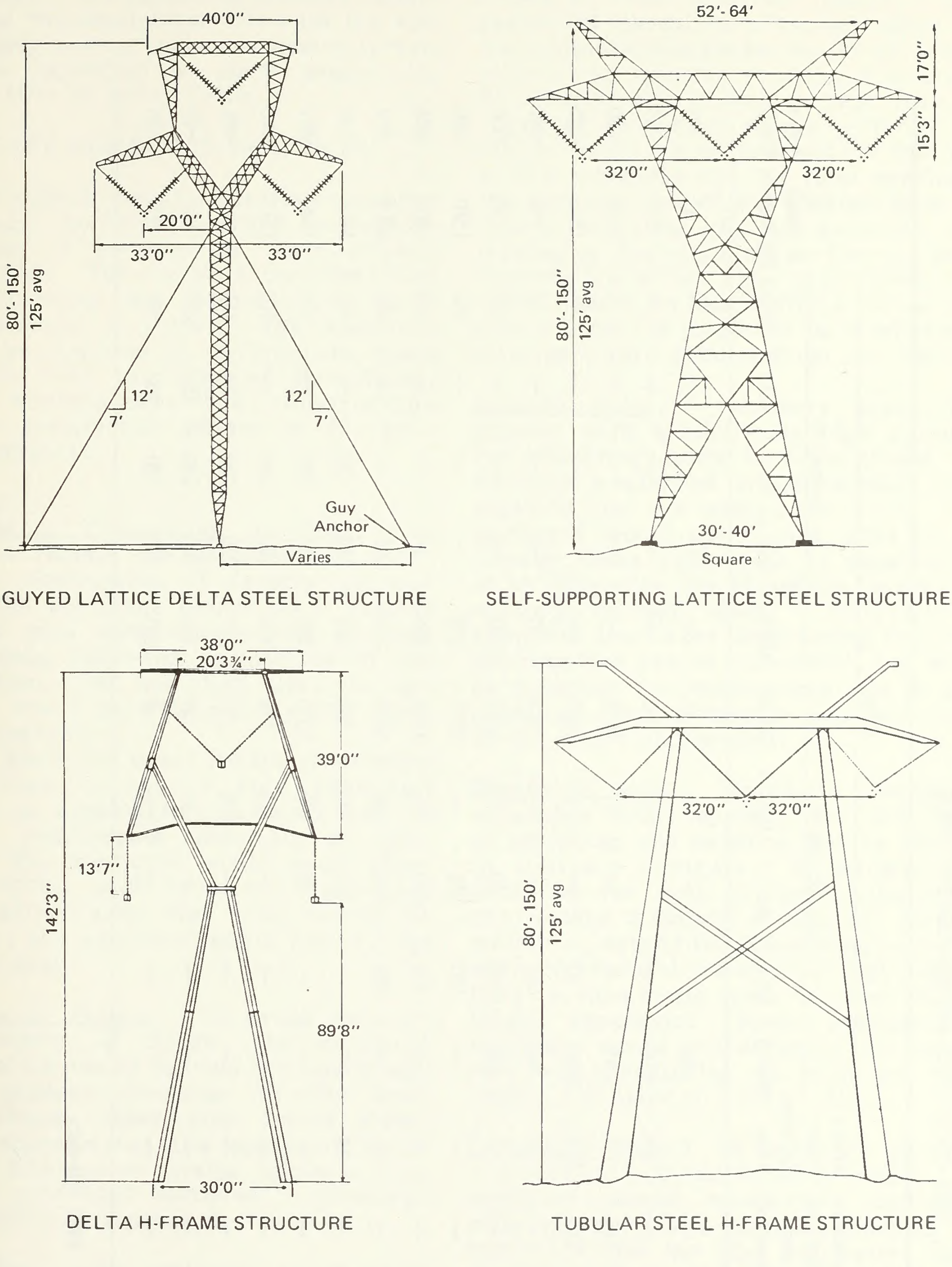


Figure 1-4. ALTERNATIVE 500 kV STRUCTURE TYPES

Table 1-5. NMGS CONSTRUCTION AND OPERATION EMPLOYMENT

			NMGS											
			Construction					Operation						
Year	Intake Pipeline and Reservoir	500-kV Transmission Line	Unit 1	Unit 2	Unit 3	Unit 4	Total	Unit 1	Unit 2	Unit 3	Unit 4	Total	Total Employment	Annual Change
1985	—	—	85	—	—	—	85	—	—	—	—	—	85	+85
1986	—	—	800	—	—	—	800	—	—	—	—	—	800	+715
1987	115	—	1515	—	—	—	1630	—	—	—	—	—	1630	+830
1988	295	104	1180	30	—	—	1505	—	—	—	—	—	1505	-125
1989	—	—	360	450	—	—	914	30	—	—	—	30	944	-560
1990	—	—	100	940	40	—	1080	200	—	—	—	200	1280	+336
1991	—	—	—	750	570	—	1320	250	—	—	—	250	1570	+290
1992	—	—	—	270	1260	—	1530	250	24	—	—	274	1804	+234
1993	—	—	—	105	955	30	1090	250	160	—	—	410	1500	-304
1994	—	78	—	—	325	435	838	250	200	30	—	480	1318	-182
1995	—	—	—	—	90	940	1030	250	200	200	—	650	1680	+362
1996	—	—	—	—	—	775	775	250	200	250	—	700	1475	-205
1997	—	—	—	—	—	255	255	250	200	250	24	724	979	-496
1998	—	—	—	—	—	95	95	250	200	250	160	860	955	-24
1999	—	—	—	—	—	—	0	250	200	250	200	900	900	-55

Source: 1980 PNM data.

of all construction workers at the station site would be in-migrants, depending on local availability of qualified craftsmen. The number of workers enlisted from the local labor force for the water supply system and transmission system is also dependent on local availability at the time of construction.

APPLICANT-COMMITTED PRACTICES

The applicant would undertake a number of design, construction, and restoration practices in addition to those already mentioned. The resource considerations outlined below are intended to reduce environmental impacts. The applicant would be required to incorporate these practices into the Plan of Operations, which encompasses the construction through termination phases of the proposed project.

Geology

Spontaneous Combustion of Coal. In order to reduce the likelihood of spontaneous combustion of freshly exposed coal, the applicant would cover freshly exposed coal with clayey soil as soon as possible following completion of the excavation. At the plant site, the applicant would entirely remove the coal, where feasible.

The applicant would locate preexisting coal fires to reduce this potential hazard to construction workers and to project components underlain by coal beds. The applicant would avoid identified active coal fires when possible. If an active coal fire area cannot be avoided, the applicant would remove the burning coal.

Accelerated Erosion. To avoid accelerated erosion of slopes, the applicant would avoid use of tunnels and shafts and would excavate trenches directly down steep slopes rather than across them. Where appropriate, the applicant would install interceptor drains upslope from freshly excavated surfaces. Disturbed areas would be replanted.

Landslides. The applicant would avoid landslide hazards by careful planning of routing, construction techniques, and project component placement. Installation of pipelines in tunnels and shafts, and laying back the slope to a stable configuration, would be used where appropriate to avoid landslide hazard. Mitigation of landslide potential along the transmission line routes would be accomplished by placing towers individually determined safe distances back from the edges of buttes or mesas. These distances would be determined on the basis of the thickness and the joint spacing of the cap rock and of the configuration and characteristics of the geologic unit making up the slope below the cap rock. Observation of the size of previous landslide masses in the vicinity would provide a basis for judgment as to what constitutes a safe setback from the edge.

Soluble Soils. Coarsely crystalline gypsum with a relatively high potential for dissolving tends to be confined to a strongly weathered or decomposed shale adjacent to the ground surface. The applicant would avoid such soils by removing these soils prior to construction or by extending the structure foundations entirely through them. Mitigation by chemical treatment or grouting following construction can be successful, but would be reserved for contingency use in case problems develop despite implementation of the above approaches.

Expansive Soils. Problems caused by expansive soils typically are the result of shrinking and swelling due to changes in moisture content. To mitigate the potential for such problems, the applicant would maintain a constant level of moisture, extend the foundation below the zone of seasonal moisture change, or use lime to chemically treat swelling clay to inhibit expansion. Where possible, the applicant would overexcavate the expansive soil, replacing it with an engineered fill prior to construction.

Collapsing Soils. In order to mitigate the effect of collapsing soils, the applicant would consolidate collapsing soils by erecting a dike and flooding the surface within the dike perimeter. Depending upon the thickness of the zone of collapsible soil, the applicant would extend the structure foundations to a noncollapsible material having an adequate

bearing capacity. Other mitigation methods that would be used by the applicant where appropriate include repeatedly dropping heavy weights on the construction area or use of compaction grouting. The most appropriate approach for any given site would be determined by a geotechnical engineer, following subsurface investigations and laboratory testing.

Piping. The surface soils at the reservoir sites would be tested by the applicant to ascertain whether a potential for piping exists. If such a potential does prove to exist and it is not feasible to remove the unsuitable soils, the reservoir would be lined.

Mine Subsidence. If it is possible to enter the mine, the applicant would construct a bulkhead at either end of the portion of the mine that is to be filled. Other methods the applicant would use to reduce the likelihood of ground surface subsidence over a mined area is to backfill the mine, when feasible. This would be accomplished by injecting a slurry of portland cement and pulverized fuel ash or fly ash under high pressure.

Potentially Active Faults. The applicant would avoid known active fault traces. In the case of linear structures, such as transmission lines, tower footings would be kept off fault traces and sufficient slack would be allowed in the section of wires above the fault that anticipated movement could be accommodated.

If the likelihood of ground rupture is low (but not nil), a degree of protection would be afforded by providing a thick (perhaps 5-foot) blanket of sand across the site prior to erecting the structure. The objective of this approach is to allow shearing to occur in the sand while limiting the likelihood of shearing in the building. This approach would not be attempted without the advice of a structural engineer having extensive experience with earthquake effects and seismic design. Application of this approach would also require a knowledge of the type and amount of fault displacement that might occur. A site-specific fault investigation would be undertaken where necessary for siting facilities, particularly for the proposed Rio Puerco Station.

Seismically Induced Ground Failure. The potential for liquefaction of saturated granular sediments is commonly ascertained by means of standard penetration tests in the field and grain size analyses in the laboratory, followed by comparison of the results with correlation charts for the expected earthquake acceleration. If liquefaction appears possible, the applicant would undertake, as appropriate, avoidance; densification of the foil by grouting, vibroflotation, or compaction; or extending foundations to a good bearing layer. Choice of the appropriate option would be based upon both site-specific subsurface data and project economics. Landsliding is another common form of seismically induced ground failure. The mitigation methods for seismically induced landslides are the same as those for gravity-induced landslides.

Strong Ground Shaking. The applicant would use appropriate structural designs to mitigate the potential adverse effects of strong ground shaking. For some structures the applicant would perform a dynamic analysis to determine the potential for a hazard. Transmission towers would not only be designed to be sufficiently strong and flexible to withstand the vibrations but would be anchored so as not to topple.

Paleontology

The applicant would avoid where prudent and feasible those areas where paleontological resources of exceptional scientific value have been identified. If avoidance is not prudent or feasible, data recovery (i.e., scientifically controlled excavation, analysis, and curation) of the affected resources would be undertaken. Such a recovery program would be developed for areas classified as being of high to moderate paleontological sensitivity within the proposed project areas (Map 3-1) and would continue up to 2 years, as necessary.

Soils

The applicant would protect soil resources where appropriate by mulching denuded areas or covering with jute

fabric or riprap, topsoiling, using drainage control (e.g., water bars) measures, and reseeding.

Vegetation

The applicant would minimize the area of vegetation removed and disturbed during construction activities. Topsoil would be stockpiled for use in revegetation where such soils exist and where only short-term construction will take place. The applicant would conduct surveys in areas of potential habitat for special status plants indicated to be most likely affected by the project. The applicant would revegetate disturbed areas within ROWs with vegetation recommended by wildlife specialists, especially in the elk and deer crucial range areas. Trees used as nesting sites would be allowed to stand if removal is not essential to component construction. This would allow raptors to return to historical nest sites after construction disturbances are terminated.

Cultural Resources

Prior to initiating any ground disturbance, the applicant would take all required actions to locate and protect cultural resources in accordance with the inventory plan to be developed by the BLM in consultation with the New Mexico State Historic Preservation Officer. This inventory plan would include provisions for a 100 percent BLM Class III Inventory in those areas that would be directly disturbed by project activities. Areas to be inventoried would be determined after engineering surveys have been completed along selected route alternatives. Other topics covered in the plan would be agreements for the evaluation of resources in terms of their eligibility for listing on the National Register of Historic Places, avoidance of significant resources by redesign or realignment of facilities, and implementation of an approved mitigation plan for the protection of significant resources that cannot be prudently and feasibly avoided.

Visual Resources

The applicant would reduce or eliminate certain significant visual consequences that have been identified for the NMGS and transmission lines. General mitigating actions that would be undertaken include architectural or design changes to physical structures, resiting of components, and landscaping techniques.

The applicant would reduce the extent of visual contrast in form and line of plant components by painting (or leaving concrete unpainted) the stacks, storage tanks, boiler and generator housing, and other massive or vertical structures two or more colors, in a banded manner, to blend with the horizontal layering of colors in the natural setting. Transmission line lattice steel towers would be finished to match the surrounding landscape in visually sensitive areas. The paint color sandstone brown, in a matte finish, would be used for blending with the neutral, light colors of most of the semiarid landscape traversed by the transmission line alternatives. The exception to this is the portion of the T4 alternative (approximately MP 65 to 100) where the study area traverses the San Mateo Mesa and Cibola National Forest. A flat forest green color would be used here. Other towers in nonsensitive areas would be finished with "Galva prime" matte finish to prevent the reflection of sunlight.

Waste receptacles would be provided at entry and exit points and in parking lots, and an active waste cleanup program would be maintained both on the plant grounds and along major access roads to the site.

Recreation

The applicant would assist in controlling impacts to the nearby WSAs (De-na-zin, Bisti, and Ah-shi-sle-pah) through an active employee information program. The focus of the program would be on building an awareness of the outstanding qualities that these resource areas offer when used with respect. Periodic slide presentations would be arranged in cooperation with the BLM for employees and families to explain the value of the resources and to encourage protection by the new neighbors. Display cases would be established at the plant headquarters to reinforce the historic value of the resources in the area. Active gathering of fossils and artifacts would be discouraged, and known violators would be reprimanded by company supervisors and management.

The applicant would provide employees with information on the range of camping and picnic sites available within a 100-mile radius of the plant site. The company would provide, through the Public Information Officer, information on visitation and occupancy at key resource areas (Navajo Lake, Angel Peak, etc.) on a periodic basis (every 2 weeks during peak season) so that employees can be advised to visit less-crowded areas.

An active employee information program would be initiated to discourage misuse of off-road vehicles (ORVs) in the study region and to warn employees that violators would be reprimanded. Protected and fragile areas (e.g., the Bisti WSA) would be identified, as well as pathways and undeveloped roads approved for ORV use.

To protect wilderness values, the applicant would provide information to employees and contractors regarding the fragile nature of wilderness areas and visitors' responsibilities. The applicant would identify other recreation resources within a 5-hour travel distance.

Transportation

To reduce the number of commute vehicles associated with NMGS, the applicant would actively encourage company personnel and contractors to share rides or use private contractor commute buses. The applicant would initiate an origin-destination commute file for company personnel and provide assistance in arranging ride-share programs for employees.

Social and Economic Conditions

The availability of housing and human services would be reassessed by the applicant 12 months prior to project start-up. Appropriate mitigation measures would be determined at that time, if necessary. Mitigation options that might be considered include:

- Provision of a construction worker camp
- Mortgage interest rate subsidies to NMGS employees
- Company-sponsored development of mobile home park space for employees
- Company counselors and social workers
- Community service agency liaison

Native American Values and Lifestyles

The applicant would attempt to enhance any potential opportunities to improve local facilities and services utilized by Native Americans (e.g., water supply, access roads) whenever possible. The applicant would undertake recruitment and training programs to ensure that Native Americans have an opportunity to gain from potential employment benefits of the project.

NO-ACTION ALTERNATIVE

The purpose of the analysis of the no-action alternative is to provide a benchmark, enabling decision makers to compare the magnitude of environmental effects of the Proposed Action and alternatives. For the purpose of this EIS, the no-action alternative is defined as the NMGS not being constructed and operated.

If the no-action alternative is selected and there is a need for electricity that PNM must meet, PNM would need to consider alternative means of providing for the need for baseload power in a manner different from NMGS.

The analysis of the no-action alternative therefore considered reasonably predictable consequences of not building NMGS. Based on a screening process, several alternatives were retained for consideration as reasonably predictable consequences of no action (Table 1-6). The analysis of other power sources or need reduction alternatives is detailed in the technical report on Alternatives to the Project.

DELAY-OF-ACTION ALTERNATIVE

The delay-of-action alternative is defined as a delay of one or more years. The delay could be in the start of construction of Unit 1 or in the time of beginning of construction of Units 2, 3, and 4.

SUMMARY OF IMPACTS FOR ALTERNATIVES

Tables 1-7, 1-8, and 1-9 present a summary of the impacts that would be expected for each alternative. Information presented in this section comprises a summary of impacts in a comparative form, which is based on the analysis in Chapter 3. Impacts described in Tables 1-7 and 1-8, and 1-9 include those identified as significant and others that are not

Table 1-6. NO-ACTION ALTERNATIVES

Coal conversion plant	A coal gasification facility in conjunction with either a combined-cycle or fuel-cell generating plant. This would probably not be commercially available until the mid-1990s.
Decentralized coal-fired steam electric system	Two or more small coal-fired plants with the same combined capacity as NMGS, built at two or more locations.
Geothermal plant	A generating plant using steam from underground high-temperature (>150°C) hot water reservoirs.
Nuclear plant	A light-water fission reactor plant. Operation of such a plant could probably not commence until the mid-1990s.
Out-of-state power source	This alternative would rely on either contract purchase of out-of-state power or equity participation in one or more out-of-state generation projects.
Renewable resource alternatives	This is a combination strategy involving a variety of renewable generation resources, possibly including large hydroelectric, central-station solar-thermal electric and photovoltaic, decentralized photovoltaic, central-station wind, agricultural and forestry wastes, and wood-fired generation. Energy storage might be required with this alternative.
Other sites	Other sites potentially capable of supporting a 2000-MW coal-fired steam electric generating station may have to be considered.
Alternative use of San Juan Basin coal	The coal may either be used locally within the basin for another proposed facility, such as a coal gasification plant, or exported for use outside the basin.

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION

Environmental Resources and Impact Topics	Proposed Action[a]
CONSTRUCTION/OPERATIONAL ACREAGE	8786[b]
AIR QUALITY	
Maximum estimated 24-hour/annual SO_2 ambient concentration increases in project vicinity due to NMGS alone (in ppm)	0.029/0.002
Maximum estimated 24-hour/annual NO_2 ambient concentration increases in project vicinity due to NMGS alone (in ppm)	0.054/0.003
Maximum estimated 24-hour/annual TSP ambient concentration increases in project vicinity due to NMGS alone (in $\mu g/m^3$)	13-27/3-5
GEOLOGIC HAZARDS	
Miles of ROW across areas with potential slope instability	38
Project component acreage in areas with spontaneous combustion potential	2813
MINERAL RESOURCES	
Consumptive use of coal/limestone over 40-year power plant life (in millions of tons)	300/4
Miles of ROW across recoverable coal (estimated underlying recoverable coal in millions of tons)	17.5 (18.8)
PALEONTOLOGICAL RESOURCES	
Project component acreage in highly sensitive areas	3707
Project component acreage in moderately sensitive areas	2252

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (continued)

Environmental Resources and Impact Topics	Proposed Action[a]
SOILS RESOURCE	
Project component acreage in areas with high wind erosion susceptibility	5126
Project component acreage in areas with high water erosion susceptibility	1532
HYDROLOGY	
Streamflow reduction (cfs) in the San Juan River downstream of the intake on an average basis	48
WATER QUALITY	
Estimated maximum increase in average levels of total dissolved solids downstream along the Colorado River at Imperial Dam in mg/l (percent increase)	4(0.39)
VEGETATION	
Acres of sand wash and saline lowland vegetation disturbed	702
Acres of badlands and steep slopes vegetation disturbed	323
Acres of shrublands and grasslands vegetation disturbed	7037
Acres of juniper and pinyon-juniper vegetation disturbed	722
Acres of riparian vegetation and irrigated cropland disturbed	2
WILDLIFE	
Acres of mule deer crucial winter range that would be disturbed during construction/removed from production over the life of the project	67/36

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (continued)

Environmental Resources and Impact Topics	Proposed Action[a]
WILDLIFE (continued)	
Number of raptor nests within 5 miles of project components	51
Number of raptor nests within 1 mile of project components	2
THREATENED AND ENDANGERED SPECIES	
Number of threatened and endangered plant species with potential habitat disturbed	1 (Sclerocactus mesae verdae)
Number of threatened and endangered plant species potentially affected by acid precipitation	1 (Astragalus humillimus)
Number of threatened and endangered aquatic species potentially affected by acid precipitation	1 (Salmo clarki stomias)
VISUAL RESOURCES	
Project component acreage that would exceed contrast ratings for VRM Class II areas	364
Project component acreage that would exceed contrast ratings for VRM Class IV areas	1125
RECREATION	
Estimated maximum annual increase in fishing demand in user participation days for San Juan and McKinley counties (in 1992)	7183
Estimated maximum annual increase in boating, swimming, and waterskiing demand in user participation days for San Juan and McKinley counties (in 1992)	4176

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (continued)

Environmental Resources and Impact Topics	Proposed Action[a]
RECREATION (continued)	
Estimated maximum annual increase in camping, picnicking, and hiking demand in user participation days for San Juan and McKinley counties (in 1992)	10,208
Estimated maximum annual increase in sight-seeing/visiting historical sites/photography demand in user participation days for San Juan and McKinley counties (in 1992)	4550/1654/4956
TRANSPORTATION	
Estimated addition of vehicles to crosstown traffic in Farmington during peak periods of the day for peak employment years (percent increase in traffic)	650 (10-20)
Estimated increase in vehicles during peak commute periods of the day along N.M. 371 for peak employment years	650
SOCIAL AND ECONOMIC CONDITIONS	
Estimated maximum annual population increase in San Juan County in 1995 (percent increase over baseline projections)	3400 (3.2)
Estimated maximum annual population increase in Farmington in 1995 (percent increase)	1975 (4.4)
Estimated peak annual increase in demand for housing units in 1995 in the greater Farmington area	1190
Projected maximum annual direct and indirect personal income generated in San Juan and McKinley counties in 1992 (in constant 1980 dollars)	75,671,000
Projected total direct and indirect personal income generated in San Juan and McKinley counties between 1984 and 2000 (in constant 1980 dollars)	782,282,000

Table 1-7. SUMMARY OF POTENTIAL IMPACTS FOR PROPOSED ACTION (concluded)

Environmental Resources and Impact Topics	Proposed Action[a]
SOCIAL AND ECONOMIC CONDITIONS (continued)	
Estimated undiscounted cumulative net surplus in municipal operating funds generated between fiscal years 1985 and 2000 (in constant 1980 dollars)	
Farmington	221,000
Aztec	161,000
Bloomfield	132,000
Estimated effects on all San Juan County operating funds between 1985 and 2000 (in constant 1980 dollars)	
1985	-2000
1990	+427,000
1995	+2,060,000
2000	+3,040,000

[a]For the purposes of this table, the Proposed Action includes: NMGS; proposed main water pipeline P1 (including Farmington intake pumping plant and 3 intermediate booster pump stations); proposed reservoir R1; proposed transmission line corridor T1; proposed transmission line corridor T2; proposed NMGS to FC-A-P 500-kV transmission line loop (T5); and Rio Puerco Station.

[b]Other land uses would be precluded on 3192 acres.

Table 1-8. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING ALTERNATIVE WATER SUPPLY SYSTEMS

Environmental Resources and Impact Topics	Water Supply: Proposed-35,000 ac-ft/yr from San Juan River	Water Supply: 20,000 ac-ft/yr from San Juan River, 15,000 ac-ft/yr Groundwater	Water Supply: 20,000 ac-ft/yr from San Juan River	Water Delivery: Proposed-Intake for Water Pipeline P1	Water Delivery: Intake for Water Pipelines P2 and P3	Water Delivery: Proposed-Water Pipeline P1[a]	Water Delivery: Water Pipeline P2[a]	Water Delivery: Water Pipeline P3[a]	Water Storage: Proposed-Reservoir R1	Water Storage: Reservoir R2
CONSTRUCTION/OPERATIONAL ACREAGE	NA	NA	NA	35	35	439[b]	473[b]	579[b]	640	320
GEOLOGIC HAZARDS										
Miles of ROW across areas with potential slope instability	NA	NA	NA	NA	NA	1	5	2	NA	NA
Miles of ROW across areas with spontaneous combustion potential	NA	NA	NA	NA	NA	6.7	8.6	8.5	NA	NA
MINERAL RESOURCES										
Miles of ROW across recoverable coal (estimated underlying recoverable coal in millions of tons)	NA	NA	NA	NA	NA	5 (5)	5 (5)	4.5 (4.5)	NA	NA
PALEONTOLOGICAL RESOURCES										
Miles of ROW across highly sensitive areas	NA	NA	NA	NA	NA	2	2	13	NA	NA
Miles of ROW across moderately sensitive areas	NA	NA	NA	NA	NA	37.7	40.6	35.5	NA	NA
SOILS RESOURCE										
Miles of ROW across soils with high wind erosion susceptibility	NA	NA	NA	NA	NA	31.7	28.4	34	NA	NA
Miles of ROW across soils with high water erosion susceptibility	NA	NA	NA	NA	NA	1.6	2.6	3.6	NA	NA
Acres of soils which are highly susceptible to wind erosion	NA	NA	NA	0	0	346	310	371	35	0
Acres of soils which are highly susceptible to water erosion	NA	NA	NA	0	0	17	28	39	0	4
HYDROLOGY										
Steamflow reduction (cfs) in the San Juan River downstream of the intake on an average basis	48	28	28	NA	NA	NA	NA	NA	NA	NA

Table 1-8. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING ALTERNATIVE WATER SUPPLY SYSTEMS (continued)

Environmental Resources and Impact Topics	Water Supply			Water Delivery					Water Storage	
	Proposed-35,000 ac-ft/yr from San Juan River	20,000 ac-ft/yr from San Juan River, 15,000 ac-ft/yr Groundwater	20,000 ac-ft/yr from San Juan River	Proposed-Intake for Water Pipeline P1	Intake for Water Pipelines P2 and P3	Proposed-Water Pipeline P1[a]	Water Pipeline P2[a]	Water Pipeline P3[a]	Proposed-Reservoir R1	Reservoir R2
HYDROLOGY (concluded)										
Drawdown (in feet) which would occur to groundwater users whose wells tap the Westwater Canyon Member, Dakota Sandstone, and Entrada Sandstone aquifers in the San Juan structural basin	NA	25	NA	NA	NA	NA	NA	NA	NA	NA
WATER QUALITY										
Estimated maximum increase in average levels of total dissolved solids downstream along the Colorado River at Imperial Dam in mg/l (percent increase)	4 (0.39)	2.3 (0.22)	2.3 (0.22)	NA	NA	NA	NA	NA	NA	NA
Short-term increases in turbidity levels immediately downstream from intake construction activities (yes or no)	NA	NA	NA	Yes	Yes	NA	NA	NA	NA	NA
VEGETATION										
Acres of sand wash and saline lowland vegetation disturbed	NA	NA	NA	2	0	4	49	4	27	12
Acres of badlands and steep slopes vegetation disturbed	NA	NA	NA	0	0	44	44	44	51	16
Acres of shrublands and grasslands vegetation disturbed	NA	NA	NA	31	5	350	276	381	562	292
Acres of juniper and pinyon-juniper vegetation disturbed	NA	NA	NA	0	0	41	6	107	0	0
Acres of riparion vegetation and irrigated cropland disturbed	NA	NA	NA	2	30	0	98	3	0	0
WILDLIFE										
Miles of ROW across mule deer crucial winter range	NA	NA	NA	NA	NA	2.8	1	1	NA	NA

Table 1-8. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING ALTERNATIVE WATER SUPPLY SYSTEMS (concluded)

Environmental Resources and Impact Topics	Water Supply: Proposed-35,000 ac-ft/yr from San Juan River	Water Supply: 20,000 ac-ft/yr from San Juan River, 15,000 ac-ft/yr Groundwater	Water Supply: 20,000 ac-ft/yr from San Juan River	Water Delivery: Proposed-Intake for Water Pipeline P1	Water Delivery: Intake for Water Pipelines P2 and P3	Water Delivery: Proposed-Water Pipeline P1[a]	Water Delivery: Water Pipeline P2[a]	Water Delivery: Water Pipeline P3[a]	Water Storage: Proposed-Reservoir R1	Water Storage: Reservoir R2
WILDLIFE (concluded)										
Acres of mule deer crucial winter range that would be removed from production over the life of the project	NA	NA	NA	35	35	1	0	0	0	0
THREATENED AND ENDANGERED SPECIES										
Number of threatened and endangered plant species with potential habitat traversed or affected	NA	NA	NA	0	0	1 (Sclerocactus mesae verdae)	1 (Sclerocactus mesae verdae)	1 (Sclerocactus mesae verdae)	0	0
CULTURAL RESOURCES										
Number of presently identified archaeological and/or historic sites within study area[c]	NA	NA	NA	NA	NA	71	79	64	NA	NA
VISUAL RESOURCES										
Percent VRM Class II	NA	NA	NA	0	0	0	0	22	0	0
Percent VRM Class III	NA	NA	NA	100	100	92	92	60	0	0
Percent VRM Class IV	NA	NA	NA	0	0	8	8	18	100	100
SOCIAL AND ECONOMIC CONDITIONS										
Projected tax revenues for year 1 after completion (in dollars)	NA	NA	NA	—[d]	—[e]	502,580	466,061	476,170	—[f]	—[f]

Note: The following resources or considerations were not included in this table, because there is no basis for comparison: Climate, Air Quality, Noise, Recreation, Wilderness, Transportation, and Land Use Controls and Constraints.

NA = Not applicable.

[a] Including booster pump stations; final location of centerline could affect impact findings.

[b] ROW acreage would not preclude other land uses.

[c] Refer to Cultural Resources Technical Report for definitions of study areas.

[d] Included within $502,580 listed for Proposed Water Pipeline P1.

[e] Included within $466,061 and $476,170 listed for water pipelines P2 and P3, respectively.

[f] Included within the overall tax revenues for the proposed generating station.

Table 1-9. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING THE PROPOSED AND ALTERNATIVE TRANSMISSION LINE CORRIDORS

Environmental Resources and Impact Topics	Proposed-Transmission Line T1	Proposed-Transmission Line T2	Proposed-Transmission Line T5	Transmission Line T3	Transmission Line T4
CONSTRUCTION/OPERATIONAL ACREAGE	2594[a]	2448[a]	121[a]	2545[a]	3054[a]
GEOLOGIC HAZARDS					
Miles of ROW across areas with potential slope instability	9	23	5	21	46
Miles of ROW across areas with spontaneous combustion potential	12	1	1	4	4
MINERAL RESOURCES					
Miles of ROW across recoverable coal (estimated underlying recoverable coal in millions of tons)	12.5 (13.8)	0	0	2 (3.6)	Unknown
PALEONTOLOGICAL RESOURCES					
Miles of ROW across highly sensitive areas	50	0	3	0	3
Miles of ROW across moderately sensitive areas	13	35	0	1	0
SOILS RESOURCE					
Miles of ROW across soils with high wind erosion susceptibility	56.6	37.3	5	47	50
Miles of ROW across soils with high water erosion susceptibility	23.5	32	0	22.8	23.3
VEGETATION					
Acres of ponderosa and pinyon pine, oak vegetation disturbed	0	0	0	0	475
Acres of sand wash and saline lowland vegetation disturbed	151	102	0	77	17
Acres of badlands and steep slopes vegetation disturbed	70	14	97	85	80
Acres of shrublands and grass-lands vegetation disturbed	1988	2036	24	2068	2101
Acres of juniper and pinyon-juniper vegetation disturbed	385	296	0	315	381
WILDLIFE					
Acres of mule deer crucial winter range that would be disturbed during ROW construction (% of regional resource)	0	0	0	0	291 (<1)
Acres of elk crucial winter range that would be disturbed during ROW construction (% of regional resource)	0	0	0	0	291 (<1)

Table 1-9. SUMMARY OF POTENTIAL IMPACTS FOR COMPARING THE PROPOSED AND ALTERNATIVE TRANSMISSION LINE CORRIDORS (concluded)

Environmental Resources and Impact Topics	Proposed-Transmission Line T1	Proposed-Transmission Line T2	Proposed-Transmission Line T5	Transmission Line T3	Transmission Line T4
WILDLIFE (concluded)					
Number of raptor nests within 5 miles of centerline	14	25	4	11	3
Number of raptor nests within 1 mile of centerline	1	1	0	1	1
THREATENED AND ENDANGERED SPECIES					
Number of threatened and endangered plant species with potential habitat traversed	0	0	1 (Sclerocactus mesae verdae)	0	1 (Sclerocactus mesae verdae)
CULTURAL RESOURCES					
Number of presently identified archaeological and/or historic site within study areas[b]	73	164	[c]	51	156
VISUAL RESOURCES					
Percent VRM Class II	5	5	0	5	4
Percent VRM Class III	30	43	0	13	30
Percent VRM Class IV	65	52	100	82	66
Miles of ROW that would exceed contrast ratings for VRM Class II areas (number of significantly impacted areas identified)	5 (1)	10 (1)	0 (0)	25 (2)	10 (1)
Miles of ROW that would exceed contrast ratings for VRM Class IV areas (number of significantly impacted areas identified)	20 (2)	0 (0)	0 (0)	5 (1)	5 (1)
SOCIAL AND ECONOMIC CONDITIONS					
Projected tax revenues for year 1 after completion (in 1993 dollars)	700,902	647,306	55,251	712,110	849,397

Note: The following resources or considerations were not included in this table, because there is no basis for comparison: Climate, Air Quality, Noise, Hydrology, Water Quality, Recreation, Wilderness, Transportation, and Land Use Controls and Constraints. The final location of centerlines could affect impact findings.

[a]ROW acreage would not preclude other land uses.

[b]Refer to Cultural Resources Technical Report for definitions of study areas.

[c]Included within number of sites listed for T4.

considered important by the public or that provide meaningful information for the comparison of alternatives. Other, less important, impacts are discussed in Chapter 3 and in the technical reports. Information presented in this section is limited to a descriptive summary of impacts in a comparative form, which is based on the analysis in Chapter 3.

AGENCY'S PREFERRED ALTERNATIVES

NMGS alternatives are summarized in Table S-1. The BLM New Mexico State Director has the authority to issue all land use grants, permits, and amendments for public lands in New Mexico. Use of these grants and permits would be contingent on the applicant's receipt of approximately 30 other necessary permits and approvals for NMGS (see Authorizing Actions). Selection of plant system alternatives would be made during these other permitting processes. For example, selection of Best Available Control Technology for air quality would be made during the PSD (Prevention of Significant Deterioration) application process; and approval of the ultimate water supply system rests with the New Mexico State Engineer (and may include the Interstate Stream Commission, the Bureau of Reclamation, and the Secretary of the Interior).

BLM's primary responsibility for this proposal would involve ROW grants for the linear features of NMGS. Based on impact analysis (see Chapter 3 and Tables 1-7, 1-8, and 1-9), BLM has selected preferred alternatives as follows:

Water System Alternatives

- P1, which implies the proposed intake structure near Farmington and reservoir R1. The route for pipeline P1 is the shortest distance and would be located within an existing highway ROW for approximately 75 percent of its length.

Transmission System Alternatives

- T5 corridor for the 5-mile connecting loop to the approved FC-A-P for the first 500-kV line
- T3 for the second 500-kV transmission line
- T2 for the third 500-kV transmission line.

Of the four alternatives, T2 and T3 are the shortest in length and follow the greatest number of miles of existing ROWs. In addition, T2 and T3 would cross the least amount of recoverable coal.

- The Rio Puerco Station is selected as the terminus point for both T3 and T2.

AREAS OF CONTROVERSY

Areas of controversy have been raised by the public and agencies throughout the EIS process. Of the issues raised (see Chapter 4), environmental issues that were within the scope of this EIS are discussed in Chapter 3. Other areas of controversy include the following:

- Navajo-Hopi Relocation Act - selection of 35,000 acres of public land in northwestern New Mexico which includes the proposed site for NMGS.
- Navajo lawsuit - claiming 2 million northwestern New Mexico which includes the proposed site for NMGS.
- Is there a need for power from NMGS?
- Cumulative impacts of the proposed San Juan Basin development to Chaco Culture National Historical Park.
- Availability of a water source for 35,000 acre-feet per year.
- Proximity of the proposed NMGS site to the Bisti and De-na-zin WSAs and Chaco Culture National Historical Park.
- Is there a need for development of a new town?

NMGS 2

Chapter 2

AFFECTED ENVIRONMENT

This chapter provides information for the portion of the environment that, based on analysis, would be affected by the Proposed Action or alternatives. The affected environment for the Proposed Action and alternatives was analyzed for the following resources:

- Climate
- Air quality
- Noise
- Geologic setting (including geologic hazards)
- Mineral resources
- Paleontological resources
- Soils (including prime and unique farmlands)
- Hydrology
- Water quality
- Vegetation
- Wildlife
- Threatened and endangered species
- Cultural resources
- Visual resources
- Recreation resources
- Wilderness values
- Transportation
- Social and economic conditions (including traditional values and lifestyles)

The amount of detail presented for each resource topic is commensurate with the anticipated level of significance of the impact. Thus the affected environment is described in greater detail where significant impacts are expected and in less detail where no significant impacts are expected. Further description of the affected environment, where no significant impacts are expected, is provided in technical background reports.

Baseline data were compiled from existing sources for each resource topic in geographic areas of influence determined by the impact analysis in Chapter 3. These geographic areas of influence for each resource are defined and summarized below for each resource topic. Generally, these areas of influence included:

- The area in the immediate vicinity of the proposed NMGS plant site, water pipelines, transmission lines, and other surface facilities.
- A larger area of influence that extended beyond sites of surface disturbances and construction activities to a distance where impacts could no longer be reasonably identified with the project. For many resources, this larger area of influence extended a considerable distance (e.g., 100 miles for recreation resources) beyond construction sites and designated ROWs.

Resource topics are discussed under headings for the proposed and alternative generating station facilities, water supply system, and transmission system. In accordance with the CEQ regulations, this approach to EIS organization is intended to reduce the size of the EIS by avoiding duplication. Therefore descriptions of the affected environment are not repeated if the environment is similar to that of a project component already discussed.

NEW MEXICO GENERATING STATION

CLIMATE

The climate of the region surrounding the proposed NMGS is characterized as dry, high-altitude continental, with low relative humidity, a high percentage of sunshine, and a relatively large annual and diurnal temperature range. Mean average annual temperatures range from

43.8°F at Dulce, 90 miles north-northeast of the project site, to 50.5°F at Chaco Culture National Historical Park, 12 miles southwest of the project site. Annual average precipitation ranges from 17 inches at Dulce to less than 8 inches at Chaco Culture National Historical Park. Wind speeds are moderate, although strong winds often accompany frontal passages, generally during late winter and spring, and also precede thunderstorms.

AIR QUALITY

The air quality analysis focused on the following issues raised in the scoping process:

- Effects on people and population centers
- Overall effect of the project on air quality
- Fugitive dust impacts
- Visibility
- Acid precipitation
- Compliance with applicable federal and state regulations
- Weather modification
- Radionuclides

DIRECT IMPACTS

The impacts of the project's emissions on air quality were assessed for a geographic area in which concentration increases of pollutants were predicted to be greater than the EPA-specified concentration levels defined in EPA's Interpretive Ruling (40 CFR 51.18, Appendix S). These values are given below.

Computer-simulated dispersion modeling of pollutant emissions from NMGS was conducted to predict concentration increases. The area in which concentrations were predicted to be greater than these levels was a region extending approximately 47 miles in the southwest and westerly directions. In the other directions, concentration increases due to NMGS fall below the EPA-specified levels within 30 to 38 miles. As such, concentration increases due to NMGS in the San Juan River valley (including the Farmington area) have been predicted to be below these levels.

In addition to the above areas, Mesa Verde National Park and the San Pedro Parks Wilderness Area were examined because they were identified as areas of special interest in public scoping meetings.

INDIRECT IMPACTS

Indirect impacts associated with air quality are mainly related to concerns about acid precipitation. The area of influence for acid precipitation impacts comprises the San Juan Basin and high mountain lake areas of Colorado and northern New Mexico. This area represents the area immediately surrounding NMGS. The high mountain lakes are the closest sensitive receptors to acid precipitation (based on bedrock geology) to NMGS.

Acid Precipitation

Precipitation is naturally somewhat acidic because of the dissolution of atmospheric carbon dioxide (CO_2). The term "acid precipitation" is generally applied to precipitation with pH lower than 5.6, indicating that acid precursors

Pollutant	Averaging Time: Annual	24 Hours	8 Hours	3 Hours	1 Hour
SO_2 ($\mu g/m^3$)	1.0	5.0	-	25.0	-
TSP ($\mu g/m^3$)	1.0	5.0	-	-	-
NO_2 ($\mu g/m^3$)	1.0	-	-	-	-
CO ($\mu g/m^3$)	-	-	500	-	2000

other than CO_2 cause the acidity. The predominant acid precursors of precipitation with a pH lower than 5.6 are sulfur oxides (SO_x) and nitrogen oxides (NO_x), of which fossil-fuel-burning power plants are a major source.

The presence and environmental effects of acid precipitation have been measured in the eastern part of the United States, which has higher atmospheric loadings of sulfur and NO_x and poorly acid-buffered soils. To date, no conclusive baseline studies have established that similar acid precipitation potential exists for the Southwest in general and the San Juan Basin in particular. Factors in the San Juan Basin that may decrease the potential for acid precipitation include less precipitation, low humidity, and more alkaline (buffered) soils. High mountain areas in northern New Mexico and Colorado (National Atmospheric Deposition Program 1982) would have the highest potential for acid precipitation effects from activities in the San Juan Basin because of higher precipitation amounts, low baseline pH, and lower buffering capacity.

<u>Visibility</u>

Visually significant points of interest in the project region include the Bisti and De-na-zin Wilderness Study Areas (WSAs), Chaco Culture National Historical Park, Shiprock, and the Class I areas of Mesa Verde National Park. Other visual points of interest are the Chuska Mountains and the San Pedro Parks Wilderness Area. The National Park Service has conducted visibility monitoring for Mesa Verde National Park, Chaco Culture National Historical Park, and Bandelier National Monument. The standard visual range in these areas exceeds 100 miles approximately 90 percent of the time.

AFFECTED AREA

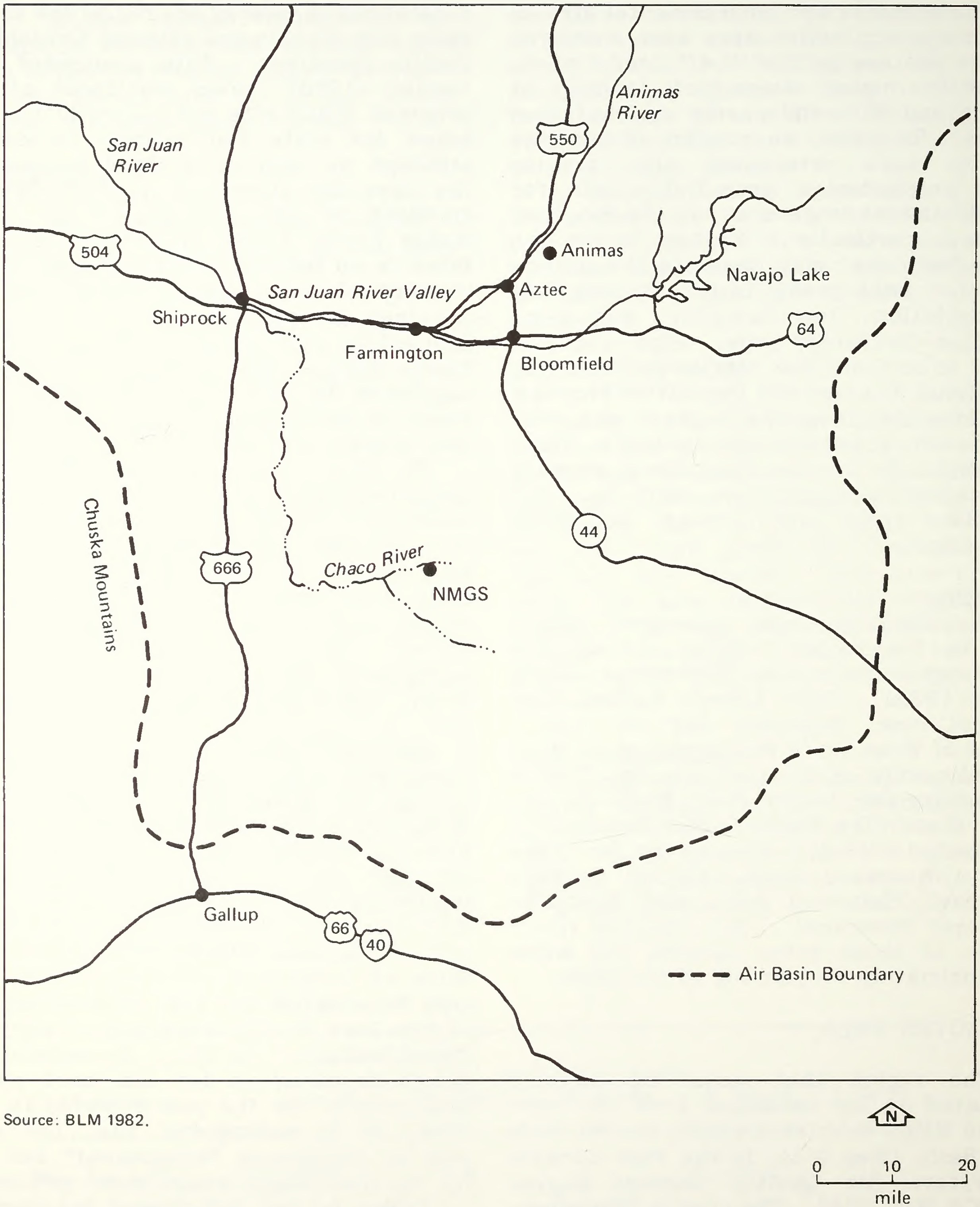
The region that would be directly affected by air emissions from the proposed NMGS is located within the San Juan Air Basin (Map 2-1), in the Four Corners Interstate Air Quality Control Region (AQCR No. 014). The area is characterized as high, flat desert surrounded by mesas and mountains. Most of the ground surface area is exposed, with ground cover averaging less than 10 percent.

Air monitoring conducted at the proposed NMGS site indicates that most of the time concentrations of sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) are at or below the threshold of detection of the monitoring instruments. Maximum concentrations measured are below the applicable New Mexico and national ambient air quality standards. Total suspended particulate (TSP) levels monitored at the proposed NMGS site are generally low and below the state and national standards, although on approximately 4 percent of the days the state and national 24-hour standard of 150 micrograms per cubic meter ($\mu g/m^3$) was exceeded. Because there is no industrial development in the vicinity of the proposed NMGS site and the land is semiarid, the high particulate values were probably caused by windblown dust. This inference is further supported by the high TSP levels that occurred during May, June, and July, when dust storms are most prevalent.

The EPA recommends using the lowest measured annual average particulate concentration as the background concentration for the 24-hour averaging period as well as for the annual average. EPA calls this level the "nonurban" background and recommends its use in rural areas. This has been done to represent background TSP levels in the San Juan River valley and at the proposed NMGS site.

The above rationale regarding windblown dust was accepted by the EPA in issuing its designation of "attainment" (i.e., in compliance with all applicable national ambient air quality standards) for TSP for the entire Four Corners Interstate Air Quality Control Region. With the exception of SO_2, this AQCR has been designated "attainment" for all criteria air pollutants. A small area outside Farmington and the northern portion of San Juan County have been designated "nonattainment" for SO_2. Because of the future requirement for increased pollution control for the power plants in this area, it is anticipated that the area will be designated "attainment" for SO_2 by the time NMGS would come on-line.

Tables 2-1 and 2-2 present the average of maximum concentrations recorded in the San Juan River valley as well as comparisons with the New Mexico and federal ambient air quality standards respectively,



Source: BLM 1982.

Map 2-1. SAN JUAN AIR BASIN

Table 2-1. COMPARISON OF THE AVERAGE OF THE MAXIMUM CONCENTRATIONS OBSERVED IN THE SAN JUAN RIVER VALLEY WITH NEW MEXICO AMBIENT STANDARDS

Pollutant	Sampling Time	Average Concentration[a]	New Mexico Standard
SO_2	Annual	0.008 ppm	0.020 ppm
	24-hour maximum	0.043 ppm	0.100 ppm
NO_x	Annual	0.011 ppm	0.050 ppm
	24-hour maximum	0.070 ppm	0.100 ppm
NO_2	Annual	0.007 ppm	0.050 ppm
	24-hour maximum	0.036 ppm	0.100 ppm
Particulates	Annual value[b]	39 $\mu g/m^3$	60 $\mu g/m^3$
	24-hour value[b]	39 $\mu g/m^3$	150 $\mu g/m^3$

[a] Reported at 633 mm Hg and 25°C.

[b] Representative values used for baseline.

Table 2-2. COMPARISON OF THE AVERAGE OF THE MAXIMUM CONCENTRATIONS OBSERVED IN THE SAN JUAN RIVER VALLEY WITH FEDERAL AMBIENT AIR STANDARDS

Pollutant	Sampling Time	Average Concentration[a] ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
SO_2	Annual	21	80
	24-hour maximum	112	365
	3-hour maximum	356	1300
NO_2	Annual	13	100
Particulates	Annual value[b]	47	75
	24-hour value[b]	47	150

[a] Calculated at 760 mm Hg and 25°C.

[b] Representative values used for baseline.

Tables 2-3 and 2-4 present the maximum concentrations recorded at the project site and comparisons with the respective New Mexico and federal standards.

Because of more stringent limitations on particulate matter and SO_2 emissions from coal-fired power plants, these emissions will be substantially reduced in the San Juan Air Basin by the time NMGS would come on-line. The baseline levels of TSP and SO_2 are thus likely to be lower than the values currently recorded. Because of interest in this region raised in scoping meetings, baseline values without NMGS have been computed and are discussed in fuller detail in the Air Quality Technical Report.

NOISE

Noise impacts were analyzed for all locations identified as sensitive receptors. These areas include the Bisti and De-na-zin WSAs and Chaco Culture National Historical Park.

The project area is in a remote location in which the only major nonnatural noise sources are vehicles traveling on roads. For the purposes of this analysis, the Bisti and De-na-zin WSAs have been identified as potential sensitive receptors. No other sensitive receptors (Chaco Culture National Historical Park) were determined to be potentially affected. Baseline noise levels in the vicinity are represented by levels measured in the De-na-zin WSA. A baseline level of 32 to 35 decibels on the A-weighted scale (dB[A]) is considered representative of the current noise baseline in secluded areas in the geographic area of influence. In areas near roadways, it is expected that noise levels would be slightly higher.

Projects in Baselines 1 and 2 were examined for purposes of determining potential noise impacts in the geographic area of influence. The only noise source identified would be the mine that would be located near the NMGS coal- and ash-handling facilities (the "hypothetical mine"). The noise levels at the Bisti and De-na-zin WSAs were projected using the noise modeling techniques. Such modeling took into account the noise levels associated with the hypothetical mine: various pieces of equipment, automobile and haul truck traffic, and blasting. From this analysis, the noise baseline was projected to be in the range of 47 to 76 dB(A) at the Bisti WSA (NM 371) and 35 to 71 dB(A) at the De-na-zin WSA (County Road C-15) depending on the distances from the roads adjacent to these WSAs and the time of day.

GEOLOGIC SETTING

The geographic area of influence for geologic resources is defined as the actual area that would be occupied by individual project components.

The NMGS would be located within the San Juan Basin, which is a structural depression underlain by Tertiary, Cretaceous, and older sedimentary rocks. A thin veneer of Late Quaternary deposits covers the bedrock units over much of the area. Volcanic necks and potentially active faults border the basin on the east. The surface of the San Juan Basin has been strongly eroded, creating badlands, buttes, mesas, and dissected plateaus. The interior of the San Juan Basin is relatively inactive tectonically, but may be subject to the effects of relatively distant earthquakes that could cause local bedrock accelerations up to about 0.2g.

Landslide blocks border many of the buttes, mesas, and plateaus, and deposits of baked shale produced by spontaneous combustion of coal are widespread. Soils with a variety of engineering defects are present in the general region (Table 3-4).

MINERAL RESOURCES

The geographic area of influence for mineral resources includes the area that would be occupied by the project components and noncontiguous areas from which mineral products to be used at the plant might be obtained, as follows:

- Areas immediately underlying proposed project features
- San Juan River Valley (probable gravel quarry)
- Grants region (possible limestone quarry)
- Southeastern Utah (possible limestone quarry)
- Southwestern Colorado (possible limestone quarry)

Table 2-3. COMPARISON OF MAXIMUM CONCENTRATIONS OBSERVED AT THE PROJECT SITE WITH NEW MEXICO AMBIENT STANDARDS

Pollutant	Sampling Time	Maximum Concentration[a]	New Mexico Standard
SO_2	Annual	0.001 ppm	0.020 ppm
	24-hour maximum	0.021 ppm	0.100 ppm
NO_x	Annual	0.002 ppm	0.050 ppm
	24-hour maximum	0.030 ppm	0.100 ppm
NO_2	Annual	0.002 ppm	0.050 ppm
	24-hour maximum	0.052 ppm	0.100 ppm
Particulates	Annual value[b]	35 $\mu g/m^3$	60 $\mu g/m^3$
	24-hour value[b]	35 $\mu g/m^3$	150 $\mu g/m^3$

[a] Reported at 633 mm Hg and 25°C.

[b] Representative values used for baseline.

Table 2-4. COMPARISON OF MAXIMUM CONCENTRATIONS OBSERVED AT THE PROJECT SITE WITH FEDERAL AMBIENT STANDARDS

Pollutant	Sampling Time	Maximum Concentration[a] ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
SO_2	Annual	3	80
	24-hour maximum	55	365
	3-hour maximum	172	1300
NO_2	Annual	4	100
Particulates	Annual value[b]	42	75
	24-hour value[b]	42	150

[a] Calculated at 760 mm Hg and 25°C.

[b] Representative values used for baseline.

- Belen area (possible limestone source 34 miles west)

Deposits of coal and baked shale are present at the proposed NMGS site. Large deposits of actively mined limestone (which could be used in the NMGS emission control process) are present near Grants and Belen, and in adjacent states in the Four Corners area.

PALEONTOLOGICAL RESOURCES

The areas of direct ground-disturbing impacts include construction zones for the plant facilities, water supply system, and transmission system. Long-term operation and maintenance of the facilities (including access roads) would also contribute to direct impacts to the area's paleontological resources.

Paleontological resources in the area considered to be the recreation resource base, those activity areas considered to be a reasonable (100 miles one way) day's drive from the major residence communities (especially Farmington and Gallup), would receive indirect impacts as a result of the proposed project.

AFFECTED AREA

The San Juan Basin has been known as an area rich in paleontological resources for more than a century. The fossils found in the basin's bedrock formations include marine invertebrates, plant mega- and microfossils, and vertebrates. The vertebrate fossils range in size from tiny teeth of mouse-sized animals to fragmentary remains of dinosaurs. Numerous research projects are currently being conducted in the area. This research includes efforts to identify factors that may have resulted in the decline and extinction of the dinosaurs and many other animal groups at the close of the Cretaceous period.

Most of the NMGS site lies on the Fruitland Formation, and a small portion of its western edge overlies the Pictured Cliffs Sandstone. Only about 10 percent of the site has bedrock exposures; the remaining 90 percent is covered by a veneer (less than 5 feet thick) of Quaternary alluvium.

Three occurrences of fossils have been reported from the proposed plant site area, all from Fruitland Formation bedrock exposed along its southern edge. None of these occurrences included significant fossils. However, the reported distribution of fossils in adjacent areas strongly suggests that this small number of reported occurrences reflects only the relatively small area of bedrock exposure on the plant site itself. The bedrock below the thin surficial Quaternary deposits is expected to be quite rich in potentially significant fossils. Well-preserved vertebrate, invertebrate, and plant fossils have been recovered from exposures at the north edge of De-na-zin Wash, less than 1 mile from the north boundary of the proposed plant site and at approximately the same stratigraphic level. In addition, extremely abundant and often well-preserved vertebrate, invertebrate, and plant fossils have been recovered from a similar stratigraphic position from exposures in Hunter Wash (Bisti Badlands) between 2 and 5 miles north-northwest of the proposed plant site. Fruitland exposures located both to the west and the east (including the Fossil Forest), which stratigraphically bracket the proposed plant site, have also yielded abundant significant fossils.

BLM locality files record an average of 39 fossil occurrences per square mile of bedrock exposure in the Bisti Badlands. A comparable abundance can be expected in the Fruitland Formation within the proposed plant site boundaries. Fossils have been reported from nearly all lithologies within the Fruitland Formation, but significant concentrations of fossils, particularly fossil vertebrates, are most frequent in cross-bedded channel sandstones. Fossils are not abundant in the Pictured Cliffs Sandstone.

SOILS

Direct impacts to the soils resource were assessed for areas that would be directly disturbed (e.g., NMGS site, ROWs, and reservoir sites) during construction, operation, and maintenance of the Proposed Action or alternatives.

Indirect impacts to the soils resource were generically assessed for areas where increased ORV access would be expected. Construction of new ROWs (e.g., pipeline and transmission lines) would allow some

previously inaccessible areas to be accessible to ORVs. The areal extent of such ORV activities is unknown, but it would probably be limited to about 5 miles on each side of new ROWs.

The soils that are present in the area proposed for location of the generating station have resulted primarily from erosion and weathering of sedimentary parent materials (e.g., sandstone, shale, and siltstone). Surface textures are primarily sandy, but range from very fine sand to clay. Many of the identified soils are moderately to highly susceptible to wind-induced erosion, while water erosion susceptibility is generally low to moderate. Table 2-5 summarizes the aspects of the existing soils environment that may contribute to soil reclamation problems for NMGS.

The soils identified at the generating station site are generally not very productive because of low available moisture, low organic matter content, and undesirable physical and chemical characteristics.

PRIME AND UNIQUE FARMLAND

The geographic area of influence for this resource includes all locations where surface facilities associated with the Proposed Action or alternatives (e.g., San Juan River intake, pump stations, NMGS, reservoir site, or transmission towers and substations) could take prime or unique farmland out of production.

The surface facilities associated with the proposed NMGS site would not be located on prime or unique farmland.

HYDROLOGY

Direct impacts associated with the generating station would be most likely to occur in the drainage area of De-na-zin Wash in the vicinity of the plant site. De-na-zin Wash, which flows east to west across the northern portion of the plant site (Map 2-2), is an ephemeral stream that flows mainly as a result of localized high-intensity thunderstorms. The channel is relatively wide, ranging from approximately 400 to 600 feet in the vicinity of the plant site. De-na-zin Wash is relatively shallow, and for the most part the banks of the channel are steep and sharply defined.

Alluvium fills the channels of arroyos throughout the study area. The composition of the alluvium ranges from silty clay to poorly sorted sand and gravel. In general, the finer-grained alluvium is found flooring the clay flats in the minor drainages close to predominantly shale or claystone source areas. Coarser sediments are found as channel fillings associated with the more important drainages. The thickness of alluvium ranges from near zero to an unknown maximum. The average thickness penetrated by monitoring wells in De-na-zin Wash in the vicinity of the plant site is 30 feet. Where saturated, the alluvium may yield ground water to shallow wells. The wells that tap alluvium in the channels of arroyos in the vicinity of the plant site area are used for domestic supply and livestock watering.

WATER QUALITY

Several factors were important in shaping the framework for analysis. The description of the project (including the design, construction, and operation aspects of various components) was the most important factor driving the analysis. This factor was used to define the geographic area of influence, as well as the generic effects of individual project components. Scoping analysis reinforced the above approach by reemphasizing important issues. Relevant water quality data were then collected in the defined areas of influence.

Direct impacts to water quality as the result of construction and operation of project components were assessed for areas in the immediate vicinity of project facilities. Other potential effects, such as spills of solvents, cleaning solutions, and fuels, and disposal of solid wastes and sewage, would also be limited to the immediate vicinity of project facilities.

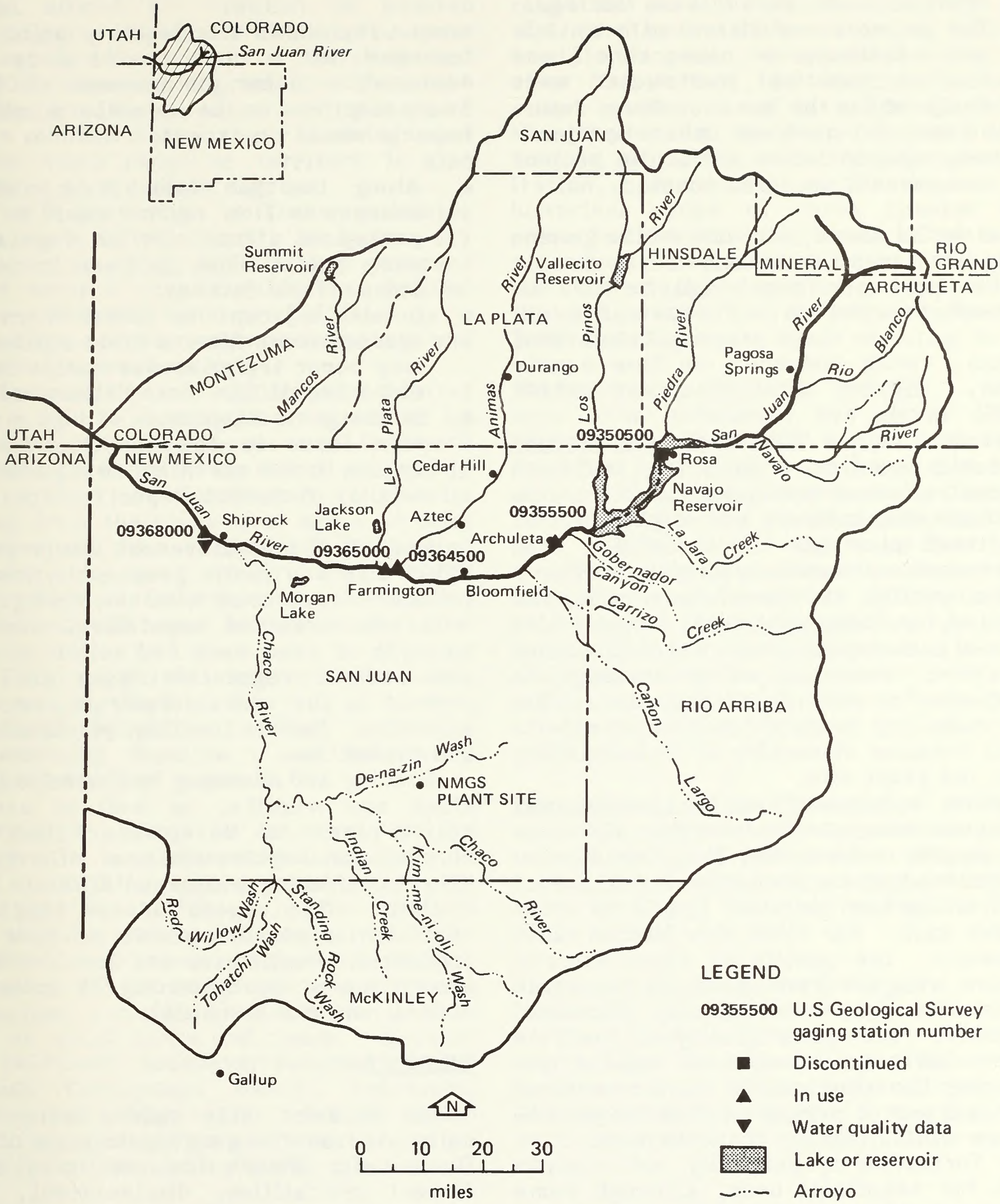
Indirect impacts to water quality were evaluated over larger areas, as discussed below:

- The impacts to water quality resulting from withdrawal of up to 35,000 acre-feet of water from the San Juan River were analyzed for the entire Colorado River System downstream from proposed and alternative intakes.

Table 2-5. SUMMARY OF POTENTIAL SOILS RECLAMATION PROBLEM AREAS AT THE PROPOSED NMGS 2400-ACRE SITE

Indicators of Potential Reclamation Problems		
High Wind Erosion Susceptibility (% of total)	High Water Erosion Susceptibility (% of total)	Steep Terrain (% of total)
2346 acres (97.7%)	168 acres (7.0%)	54 acres (2.3%)

[a]See Table 10 in the Soils and Prime and Unique Farmlands Technical Report for a listing of potential reclamation problem areas by soil association and acreage (including pertinent comments and potential mitigation measures). Table 10 also lists (or refers to) data sources, and the approach and criteria used in the compilation of this table.



Source: Adapted from U.S. Bureau of Reclamation (1976)

Map 2-2. SAN JUAN RIVER BASIN

- The potential for increased acidity due to acid precipitation was discussed for high mountain lakes in areas of Colorado and New Mexico.
- The impacts associated with anticipated increases in urban runoff and treated municipal wastewater were analyzed for the San Juan River downstream from areas where project-related population influx or project components would be located.

As noted above, streams at the generating station site are ephemeral and do not support permanent aquatic life or recreation activities. The overall quality of water in these streams, when flow occurs, varies according to flow conditions. Lower total dissolved solids (TDS) levels are associated with high flows and higher TDS levels are associated with low flows. Suspended sediment concentrations are very high. The levels of trace elements are also high; most of the trace elements are associated with suspended sediments. Specific surface-water quality standards have not been adopted for these ephemeral streams. In general, the quality of water in those ephemeral channels, after settling, is adequate for most beneficial uses. The Water Quality Technical Report provides a more detailed discussion of water quality near the plant site.

Water withdrawn from the alluvium near the generating station site has TDS levels ranging from below the New Mexico state standard for domestic water use of 1000 milligrams per liter (mg/l) to about 60,000 mg/l. For other New Mexico state standards, the quality of these alluvial waters ranges from poor to unusable (refer to the Water Quality Technical Report). The water quality of the Pictured Cliffs Sandstone (the aquifer underlying the alluvium) is more consistent with regard to ranges of TDS levels between wells. Water found in wells from this formation is generally not acceptable for beneficial uses, although some wells provide water that is marginally acceptable for livestock watering.

VEGETATION

An area of 3.75 square miles was delineated as the geographic area of influence for direct impacts to vegetation at the NMGS site. The areas of influence for indirect impacts to vegetation were defined as follows: a 5-mile radius around the NMGS site or other point disturbance, and a 10-mile-wide study area centered on linear disturbances (ROWs). Two exceptions to the area where indirect impacts would be expected include:

- Along the San Juan River, where changes in flow regime could be expected to affect riparian vegetation more than 5 miles upstream or downstream from intakes.
- In and adjacent to areas where increased recreation or other human use may occur (refer to Recreation Technical Report for these estimates)
- In the generalized area of high mountain lakes in the Rocky Mountain region to the north and west (see Air Quality Technical Report)

Most of the land area at the proposed NMGS site and in its geographic area of influence is covered with semiarid grassland and shrubland vegetation. Lesser amounts of sand wash and saline lowland and badland vegetation types are also present in the area. Water is the most important factor limiting plant growth and production.

Grazing and browsing by domestic livestock and wildlife, as well as use of native plants by Navajos, are the only current and foreseeable uses of vegetation, considering water and climatic limitations. The vegetation and rangeland condition is considered fair to poor and productivity estimates are low. Forage production is approximately 15 acres per animal unit month (AUM).

WILDLIFE

An area of 3.75 square miles was delineated as the geographic area of influence for direct impacts to wildlife (direct mortalities, displacement, loss of carrying capacity) at the NMGS site.

In addition to the areas that would be directly disturbed, a larger area of influence could be indirectly affected. The geographic areas where indirect impacts resulting from considerations of the "home range" concept and increases in

human population might occur are defined for the NMGS project as: (1) a 5-mile radius from the plant site and (2) a 10-mile-wide study area centered on proposed ROWs.

All living organisms exhibit, to some degree, a home range or territory and daily or seasonal migration. If an organism is affected in part of that home range or territory, the remaining part of its home range or territory is also affected to a certain degree.

Two adjustments to these estimates were made in the impact analysis: (1) increased hunting and fishing pressure could occur in areas outside ones defined above, and (2) acid precipitation is a long-distance transport phenomenon and was analyzed accordingly.

The quantity of wildlife and habitat that might be destroyed or disturbed by project activities (direct and indirect) was compared with the total present in the regional area defined by a 10-mile radius from the plant site, and a 20-mile linear study area centered on ROWs and associated access. Total wildlife habitat present in the regional area defined was calculated based on two baselines:

- Total wildlife habitat available assuming Baseline 1
- Total wildlife habitat available assuming Baseline 1 and Baseline 2 projects (see Appendix C)

Wildlife habitat in the area of the NMGS site is semiarid grassland/shrubland. Wildlife species associated with this habitat are listed in the Wildlife and Aquatic Biology Technical Report. Small and medium-size nongame mammals, including coyote and fox, are common. Waterfowl and shorebird habitat is limited to small tanks and ponds. Raptors are relatively abundant; common species include ferruginous hawks, red-tailed hawks, and golden eagles. Several raptor nests are present in the area of influence identified for the NMGS site.

THREATENED AND ENDANGERED SPECIES

The geographic area of influence for threatened or endangered plants is the same as that defined for Vegetation, above. The geographic area of influence for threatened or endangered animals is the same as that defined for wildlife.

The proposed NMGS would be located within or near the current or historical range of several species listed by the U.S. Fish and Wildlife Service as threatened, endangered, or candidates for review (Table 2-6). In addition, several other species occur in areas (northern New Mexico and southern Colorado) that may be subject to potential acid precipitation. Summaries of the current or historical range of these species are presented below. Additional information regarding the relative abundance and habitat use of these species is provided in the Threatened and Endangered Species Technical Report.

WILDLIFE AND AQUATIC SPECIES

Bald Eagle. No bald eagle nests are reported in the high mountain areas of northern New Mexico and southern Colorado where there is the greatest potential for acid precipitation. Although the high mountain areas in northern New Mexico and southern Colorado support relatively few bald eagles during migration periods, bald eagles are relatively common winter residents along major streams and reservoirs throughout the lower elevations of northern New Mexico and southern Colorado.

Peregrine Falcon. Peregrine falcons occur as migrants throughout the high mountain areas of northern New Mexico and southern Colorado. No nesting or important foraging habitat is reported in these areas.

Humpback Chub. Historically, the humpback chub inhabited the large tributaries of the Colorado River system. Present distribution is disjunct, and humpback chubs occur in widely isolated canyons. Although none are reported in New Mexico, their occurrence in southern Colorado is likely.

Bonytail Chub. Historically, the distribution of the bonytail chub also included most of the large tributaries of the Colorado River system. The bonytail has not been reported recently in New Mexico or Colorado (since 1960), but it does occur in the Green River in Utah.

Table 2-6. FEDERALLY LISTED SPECIES[a] (THREATENED, ENDANGERED, OR CANDIDATES FOR REVIEW) THAT ARE REPORTED TO OCCUR[b] IN AREAS THAT COULD BE AFFECTED BY CONSTRUCTION OR OPERATION OF PROJECT COMPONENTS

		General Location of Potential Habitat			
Common Name	Scientific Name	NMGS	Water Supply System	Transmission Lines	Areas That Could Be Affected by Potential Acid Precipitation
Listed					
Black-footed ferret	Mustela nigripes	—	—	x	—
Bald eagle	Haliaeetus leucocephalus	—	x	—	x
Peregrine falcon	Falco peregrinus	—	—	—	x
Humpback chub	Gila eypha	—	—	—	x
Bonytail chub	Gila elegans	—	—	—	x
Greenback cutthroat trout	Salmo clarki stimous	—	—	—	x
Colorado squawfish	Ptychocheilus lucius	—	x	—	x
Mesa Verde cactus	Sclerocactus mesae verdae	—	x	x	x
Spineless hedgehog cactus	Echinocereus triglochidiatus var. inermis	—	—	—	x
Knowlton's cactus	Pediocactus knowltoni	—	—	—	x
Candidate Plant Species					
Zuni milkvetch	Astragalus accumbens	—	—	—	x
Fleabane	Erigeron rhizomatus	—	—	—	x
Devil's claw cactus	Sclerocactus whipplei var. heilii	—	—	—	x
Bladderpod	Lesquerella pruinosa	—	—	—	x
Mancos milkvetch	Astragalus humillimus	—	—	—	x
Annual saltbush	Atriplex pleiantha	—	—	—	x

[a]Source: U.S. Fish and Wildlife Service response to BLM List Request.

[b]Reports of occurrence include historical sightings in addition to recent observations or presence of potential habitat.

Greenback Cutthroat Trout. The greenback cutthroat trout inhabits clear, cold, well-oxygenated headwater streams in high mountain areas of southern Colorado. The streams are susceptible to increases in acidity because they lack the buffering capacity of lower elevation streams.

Colorado Squawfish. Construction of the Navajo Reservoir, water depletions, and irrigation flow returns have probably resulted in the extirpation of the Colorado squawfish in the the San Juan River. In areas of the Colorado drainage that could be affected by acid precipitation, the squawfish is present, but numbers and distribution are limited.

PLANTS

Mesa Verde Cactus. The distribution of Mesa Verde cactus is limited to a few locations in southwestern Colorado and San Juan County, New Mexico. It generally occurs at lower elevations on shale badlands, including parts of the Fruitland and Kirtland formations. According to recent information and analysis of potential habitat (New Mexico Heritage Program 1982), the plant appears to occur west of R13W in New Mexico and is not expected to occur in the vicinity of the proposed NMGS project.

Spineless Hedgehog Cactus. The known distribution of this cactus is restricted to extreme eastern Utah, and Mesa, Montrose, and Ouray counties in western Colorado at elevations between 5000 and 8000 feet. Soils in the collection areas are derived from calcareous sandstone.

Knowlton's Hedgehog Cactus. The known distribution of this cactus is limited to a small portion of the Los Pinos River valley between La Boca, Colorado, and the Navajo Lake Dam in New Mexico (Knight 1982). Reports of other collections in southern Colorado have not been verified (Knight 1982). Soils in collection areas (6000-7000 feet elevation) have been derived from sandstone and shale, are alkaline, and have soil pH levels between 7.4 and 8.4.

Zuni Milkvetch. The Zuni milkvetch is a New Mexico endemic, reported only from the Zuni Mountains southeast of Gallup, but outside the area of project component disturbance and potential acid precipitation. The species is restricted to a red clay found below sandstone cliffs (New Mexico Heritage Program 1982).

Fleabane. Fleabane is restricted to geologic formations south of Fort Wingate, New Mexico (New Mexico Heritage Program 1982). This distribution is outside the area of influence for project components and is also outside the area with the highest potential for acid precipitation.

Devil's Claw Cactus. Variety heillii of Sclerocactus whipplei is reported from northern San Juan County, north of the San Juan River, in black sagebrush and pinyon-juniper vegetation types. This distribution lies outside the area of influence for project component disturbance but within the area where acid precipitation could occur.

Bladderpod. The known distribution of bladderpod is restricted to the vicinity of Pagosa Spring in Archuleta County, Colorado, on adobe soils at 7000 feet elevation. This distribution is outside the area of disturbance resulting from project components but within the area where acid precipitation could occur.

Mancos Milkvetch. Mancos milkvetch is reported from two locations on Hogback Mountain in New Mexico at elevations between 5240 and 5320 feet above sea level. Its known soil preference is limited to deep sandy soils on ledges and flat locations. This distribution is outside the areas of disturbance that would result from project components but within the area where acid precipitation could occur. The buffering ability of soils associated with this plant is unknown.

Annual Saltbush. This species is reported from southwestern Montezuma County, in Colorado and in New Mexico on clay slopes of low hills at approximately 5100 feet elevation. This distribution is outside the area of disturbance that could occur from project components but within the area where acid precipitation could occur.

CULTURAL RESOURCES

The areas of direct ground-disturbing impacts include construction zones for the plant facilities, water supply system, and transmission system. Long-term operation and maintenance of the facilities (including access roads) would also contribute to direct impacts to cultural resources in the project area.

Cultural resources in the area considered to be the recreation resource base, those activity areas considered to be a reasonable (100 miles one way) day's drive from the major residence communities (especially Farmington) would receive indirect impacts as a result of the proposed project.

AFFECTED AREA

The San Juan Basin has been inhabited for at least the past 11,000 years and retains a complex record of that human occupation. Archaeologically, the area is best known at present for its record of the Chacoans, a prehistoric Anasazi people who lived in the region from AD 500 to AD 1300. However, it also holds significant remains of earlier Paleo-Indian and Archaic cultures and later Navajo history. It is the traditional as well as present home of several Native American peoples, especially the Navajo but also the Ute to the north, the Jicarilla Apache to the east, and the Puebloans to the south and southeast. Finally, it has a sparse but significant record of historic Euroamerican habitation of the area. Archaeological and ethnological studies of prehistoric and modern cultural resources have been conducted in this area for a century, providing a basis for understanding the significance of those resources. At the same time, the complexity of this cultural resource base is such that, at present, only a small portion of it is described in sufficient detail for making specific management decisions. Such decision making must therefore rely on understanding both the undescribed resources (based on professional judgment) and the identified data. In this effort to compile known resources, the National Register of Historic Places and many other references were consulted.

A comprehensive (Class III) cultural resource survey has been completed at the proposed NMGS site. This survey has identified 40 archaeological sites there. Eighteen of these sites have Archaic remains (between 6000 and 2000 years old), 5 are Anasazi-related, 8 are Navajo, 2 are historic, and the rest are of unknown cultural affiliation. Of these, 21 have been recommended by the State Historic Preservation Officer to be eligible for the National Register of His toric Places and 3 have been declared ineligible; the rest have not yet been evaluated. In addition, 8 sites of significance to traditional Native American religious values and practices have been identified there, including a battlefield, an abandoned hogan where death has occurred, several gathering areas, a rock art site, and several religious ritual sites.

The area potentially subject to indirect impact by the proposed NMGS includes the entire San Juan Basin, as well as the Four Corners region of southwestern Colorado (especially Montezuma and Dolores counties), southeastern Utah, and northeastern Arizona. This area is included in the recreation resource base as defined for this analysis. It is the appropriate unit for evaluating potential indirect project effects on cultural resources, since a popular recreational activity in northwestern New Mexico is the surface collection of archaeological materials. In the San Juan Basin alone, the New Mexico Historic Preservation Bureau estimated that, as of 1979, 5 percent of the area had been professionally surveyed and over 9600 prehistoric sites had been identified. A similar density of materials is found in southwestern Colorado, where recent sample surveys have identified as many as 98 sites per square mile in portions of Montezuma County. Thus it is likely that over 100,000 archaeological or historic sites and a large but presently unknown number of traditionally important Native merican resources occur in the indirect impact study area.

VISUAL RESOURCES

The area of influence for visual resources includes a primary and a

secondary zone. The primary zone is the area surrounding each of the project components and alternatives from which visual contrasts resulting from the project features and landscape disturbance could be seen by the naked eye at ground level. This zone includes a 12-mile radius around the plant site,* a study area 5 miles wide on each side of the transmission lines, and a study area 3 miles wide on each side of the water pipelines.

The secondary zone is included in the analysis to address visible plumes emanating from the plant. Because the visual range on an average day in this region can be more than 128 miles, the study area was enlarged to encompass sites of critical concern, such as Chaco Culture National Historical Park and Mesa Verde National Park.

The scenic quality, sensitivity, and Visual Resource Management (VRM) classes for the NMGS are summarized in Table 2-7. Further description of the visual resource characteristics of the WSAs is contained in the recreation and wilderness discussion, below, because of the overlap with those resources. Critical viewpoints include vantage points within the Bisti and De-na-zin WSAs. Map 2-3 illustrates the region of influence and VRM ratings for landscapes encompassing NMGS components.

RECREATION RESOURCES AND WILDERNESS VALUES

RECREATION RESOURCES

Nonurban recreation resources include the managed areas and dispersed use areas that could be directly or indirectly affected by the construction, operation, maintenance, or abandonment phases of the Proposed Action or alternatives. By definition, this includes recreation lands actually traversed by the project, and those areas where project activities (such as construction noise, dust, and odor) might be noticeable enough to affect the quality of the recreation experience at nearby recreation sites. Included in this recreation inventory are recreation use areas within a 100-mile radius, or one-day's travel distance, from the cities of Farmington, Aztec, and Bloomfield, in San Juan County, where the project labor force is forecast to reside, and where increased visitor use could affect conditions at recreation resources.

Recreation resources include federal, state, and county parks, trails, and waterways where the following types of recreational activities take place: sightseeing, hunting, fishing, winter sports, float-boating, swimming, camping, picnicking, ORV operation, hiking, and so on. Because this general region is primarily semiarid, the unique qualities of water are stressed to include all recreational rivers, streams, and reservoirs in the region of influence.

The cities of Farmington, Aztec, and Bloomfield are in State Recreation Planning District 1, as are the proposed plant site, water pipeline, and reservoir. The proposed and alternative transmission lines are in Planning District 1 and extend into Planning District 3. Because it is anticipated that the majority of employees would live in San Juan County, the inventory focuses on recreation resources available in Planning District 1, but also extends as far as a 100-mile radius from the Farmington area.

WILDERNESS VALUES

Impacts to WSAs were assessed for a geographic area that extends 60 miles from all project components. Nine WSAs within this area of influence are currently under an interim policy management. The interim management will continue until Congress declares the WSA an official wilderness area, or drops it from wilderness classification.

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*The established 12-mile radius is based on a field study conducted by Woodward-Clyde Consultants, using the Four Corners and San Juan power plants as reference objects. It was concluded that plant facilities of this scale represented a perceivable element in the desert landscape that could adversely affect the scenic quality over a 12-mile range. Although the plant could be seen from more than 20 miles away on clear days, the features are not considered distinguishable enough to result in significant contrasts.

Table 2-7. VISUAL RESOURCE INVENTORY CLASSES FOR LANDSCAPES OCCUPIED BY PROJECT COMPONENTS

Project Component	Quality[a] (percent)	Sensitivity[b] (percent)	Management Objective (percent)	Notes
NMGS Plant Site	100 C	100 Low	100 VRM IV	Natural open landscape, muted colors, sandy clay soils, sparse vegetation, access by NM 371, 3 miles from Bisti WSA, 6 miles from De-na-zin.
Water Pipeline P1	5 A 85 B 10 C	8 Low 92 High	92 VRM III 8 VRM IV	First miles traverse steep, eroded bluffs and mesas near San Juan River, high scenic quality. Parallels New Mexico 371, borders Bisti WSA.
Water Pipeline P2	5 A 80 B	8 Low 92 High	92 VRM III 8 VRM IV	Parallels existing pipeline through Kutz Canyon and NIIP, gently rolling hills, mixed grasses, borders Bisti WSA.
Water Pipeline P3	22 A 16 B 62 C	8 Low 92 High	22 VRM II 60 VRM III 18 VRM IV	Kutz Canyon - steep slopes, badlands formations for first few miles; remainder rolling hills with little variety and visual interest; borders De-na-zin WSA along existing road; crosses Angel Peak Rec. Area.
Dog Eye Reservoir (R1)	100 C	100 Low	100 VRM IV	Common landscapes, little diversity or visual interest, isolated, limited access.
Highway Reservoir (R2)	100 C	100 Low	100 VRM IV	

Table 2-7. VISUAL RESOURCE INVENTORY CLASSES FOR LANDSCAPES OCCUPIED BY PROJECT COMPONENTS (continued)

Project Component	Quality[a] (percent)	Sensitivity[b] (percent)	Management Objective (percent)	Notes
<u>Transmission Line Study Areas</u>				
T1	4 A 96 B	28 Low 72 High	5 VRM II 30 VRM III 65 VRM IV	Rolling hills with intermingled breaks, sagebrush and intermingled pinyon-juniper, light soils, open expansive views, borders De-na-zin WSA, crosses Ojito WSA (4 miles), crosses proposed Continental Divide National Scenic Trail corridor north of Chaco Mesa.
T2	5 A 12 B 83 C	54 Low 46 High	5 VRM II 43 VRM III 52 VRM IV	Gently sloping, broad valleys with intermingled breaks and badlands, light sandy soils; existing 345-kV line, pipelines, and secondary roads. Adjacent to Chaco Culture National Historical Park and outlier, and Ah-shi-sle-pah WSA. Parallels Chaco Mesa on north side and crosses Cabezon WSA (a scenic volcanic plug). Crosses proposed Continental Divide National Scenic Trail corridor north of Chaco Mesa.

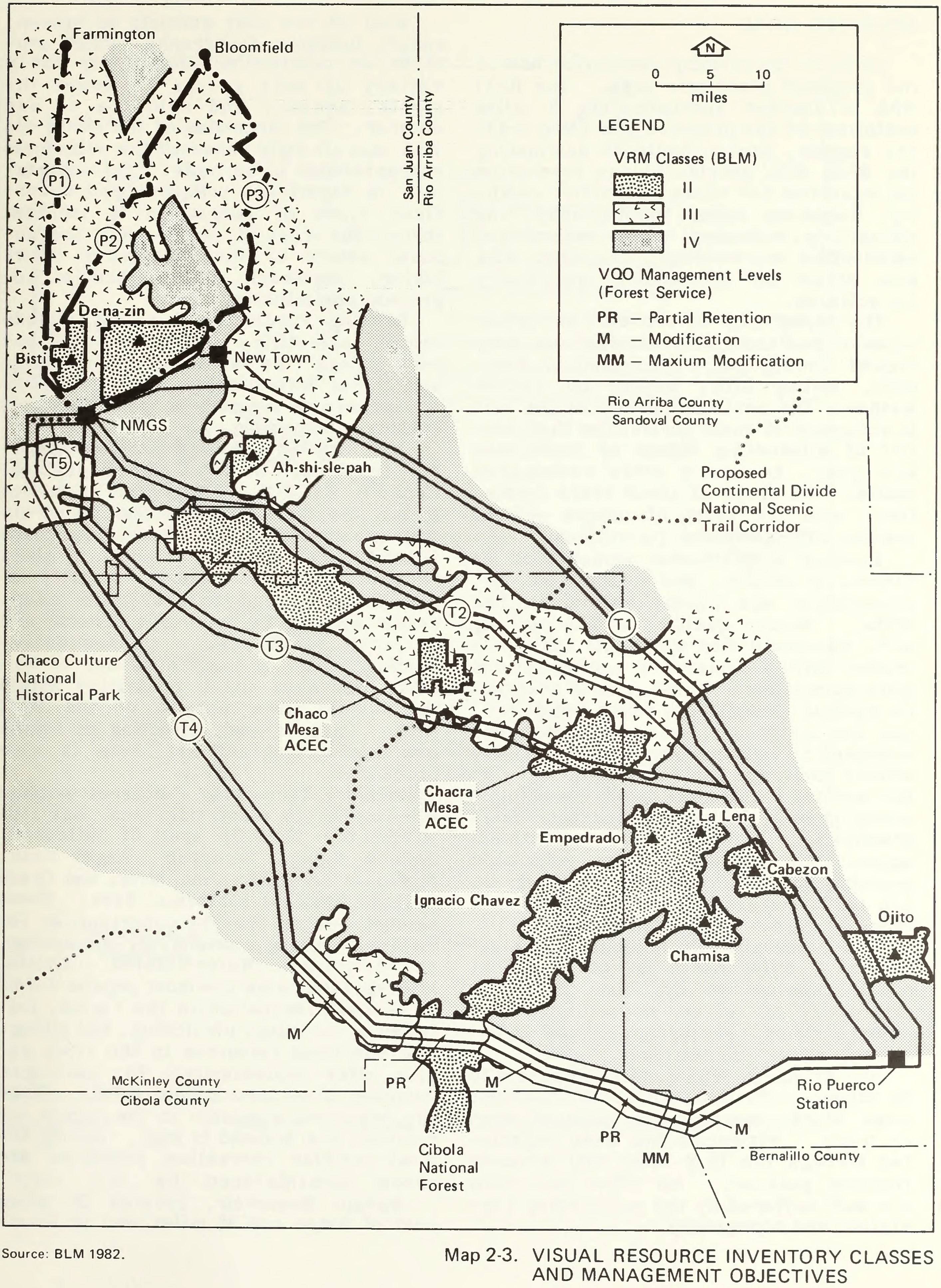
Table 2-7. VISUAL RESOURCE INVENTORY CLASSES FOR LANDSCAPES OCCUPIED BY PROJECT COMPONENTS (concluded)

Project Component	Quality[a] (percent)	Sensitivity[b] (percent)	Management Objective (percent)	Notes
T3	5 A 13 B 82 C	39 Low 48 Med. 13 High	5 VRM II 13 VRM III 82 VRM IV	Undulating hills with scattered tracts of open grasslands, little color variation; scattered range development, residences, and roads; portion borders Chaco Culture National Historical Park and southern edge of Chaco Mesa where it crosses the proposed Continental Divide National Scenic Trail corridor; similar to T2. Crosses Cabezon WSA.
T4	38 B 62 C	24 Low 64 Med. 12 High	4 VRM II 30 VRM III 66 VRM IV 4 F.S. MM 89 F.S. M 7 F.S. PR	10 miles through Cibola National Forest rolling hills, San Mateo Mesa, and Mesa Chivato, ponderosa pine woodlands, Whiterock formation, montane meadows, follows FC-A-P line; crosses proposed Continental Divide National Scenic Trail corridor.
T5	100 C	100 Med.	100 VRM IV	Common landscape; similar to plant site.

[a]Variety classes are obtained by classifying the landscape into different degrees of variety. There are three variety classes that identify the scenic quality of the natural landscape:

Class A--Distinctive; areas that combine the most outstanding characteristics of each rating factor.
Class B--Common; areas in which there is a combination of some outstanding features and some that are fairly common to the physiographic region.
Class C--Minimal; areas in which the features are fairly common to the physiographic region.

[b]Sensitivity levels are a measure of people's concern for the scenic quality of the landscape.



Source: BLM 1982.

Map 2-3. VISUAL RESOURCE INVENTORY CLASSES AND MANAGEMENT OBJECTIVES

AFFECTED AREA

There is no primary recreation use of the proposed plant site area. The Bisti WSA is located approximately 3 miles northwest of the proposed site (Map 2-4). The rugged, broken badlands dominating the Bisti WSA provide unique recreation opportunities for hiking, primitive camping, horseback riding, photography, and sightseeing. Because of its natural and uninhabited surroundings, the Bisti WSA also offers an outstanding opportunity for solitude.

The topography of the unit comprises exposed badlands characterized by very rugged terrain and a profusion of compact, rolling hills, broken by narrow washes. The northern portion of the unit is composed of shale formations that consist of alternating layers of sandstones and gray, tan, and olive variegated shales. Outcrops of these shale formations take the form of unique spires, towers, and mushroom formations.

Existing supplemental values such as scenic, scientific, and educational opportunities are highly valued in the WSAs. Scenic quality is provided by soft, unconsolidated sediments that have eroded into a variety of mushroom and spire formations. These natural badlands formations exhibit rich color variations, and the dominant form and texture are enhanced by light and shadow. The highly eroded landscape contrasts markedly with the mottled texture and homogeneous elements present in the surrounding desert grassland. Scientific and educational opportunities are provided by pronounced geologic formations, cultural resources, and paleontological resources, such as a range of fossils and petrified wood.

The De-na-zin WSA is located approximately 6 miles northeast of the plant site. Similar to the Bisti Badlands, this area also offers opportunities for hiking, riding, photography, and sightseeing, as well as solitude.

The De-na-zin WSA generally appears to be natural. The dominant human modifications within the unit are trespass ways or trails. Mitigation has been negotiated through the BLM lands and minerals trespass policies. All other intrusions are well buffered by the surrounding vegetation and topography.

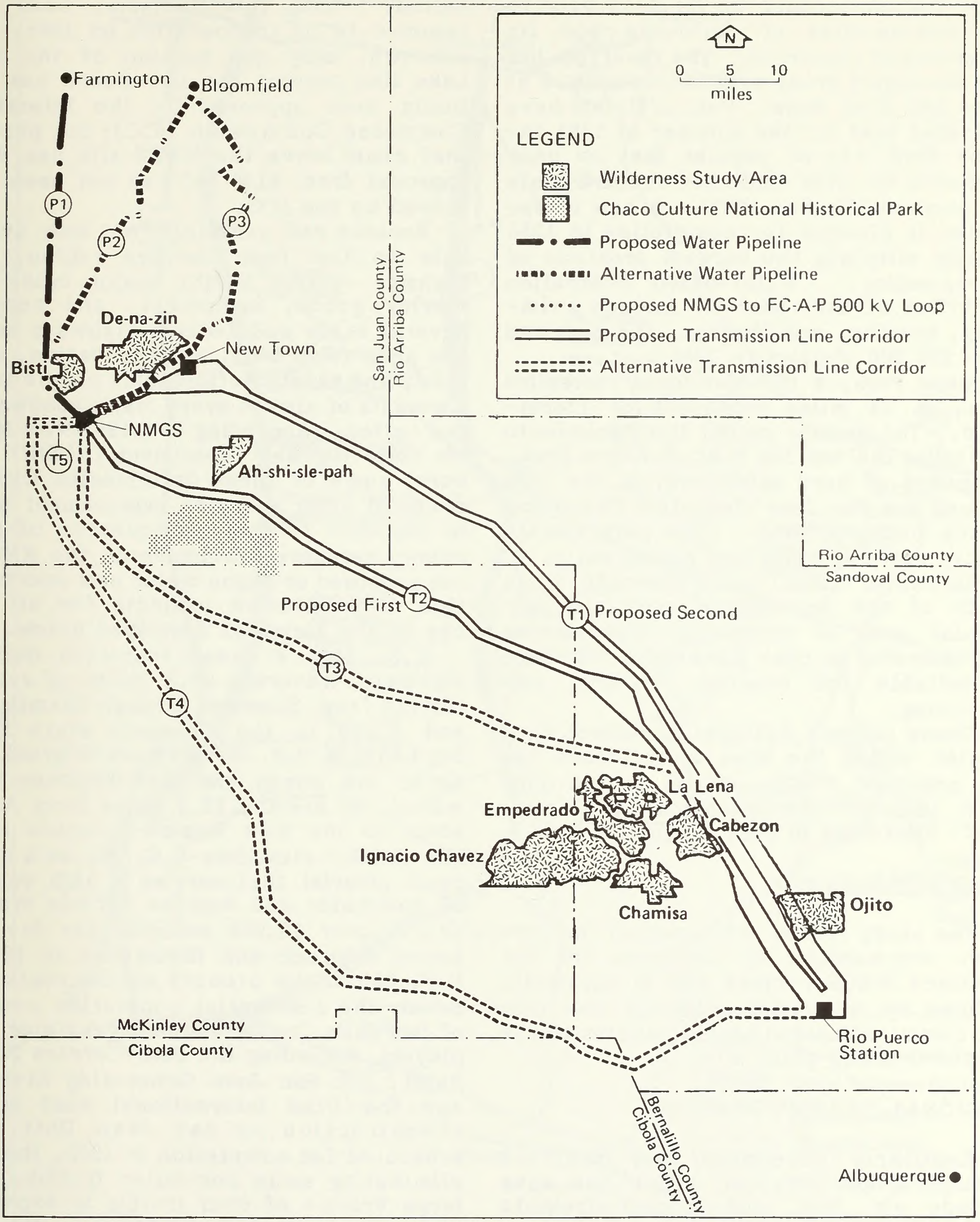
Most of the unit consists of broken, rough, badlands topography, which provides an outstanding opportunity for a variety of user groups to avoid the sights, sounds, and evidence of one another. The large size of the De-na-zin WSA also strongly enhances the wilderness characteristic of solitude. The opportunity to experience primitive and unconfined types of recreation is inherent throughout most of De-na-zin. The unusual nature of the topography offers hiking, horseback riding, and photographic possibilities.

Existing supplemental values include scenic, scientific, and educational opportunities. The sandstone-capped bluffs and mesas intermingled with the spires and mushroom formations make this unit scenically appealing.

As designated WSAs and BLM-recommended Areas of Critical Environmental Concern (ACEC), recreation activities within the Bisti Badlands and De-na-zin WSA are guided by BLM management plans (BLM 1981a). Specific attention is given to preserving the natural integrity of the landscape and to preventing irreparable damage to important historic and cultural resources. Consequently, vehicle access is limited to use of existing pathways and is prohibited within the fragile inner portion of the Bisti WSA. Unauthorized collecting of fossils and archaeological artifacts is also prohibited.

Primary recreation resources outside the immediate plant site area, but still within the 100-mile area of influence, include Navajo Reservoir, Angel Peak, Bluewater Lake, San Juan River, and Chaco Culture National Historical Park. These resource areas provide opportunities for fishing, boating, swimming, picnicking, and camping. Water-related activities are reported to be the most popular forms of summer recreation in the region, followed by camping, picnicking, and hiking. The combined resources in the study region offer approximately 861 developed camping areas and picnic sites. Since the resources available in the region are limited, the demand is high. Among the most popular recreation resources are those administered by the state.

Navajo Reservoir, located 25 miles east of Aztec and 36 miles east of Farm-



Source: BLM 1982.

Map 2-4. GENERAL LOCATION OF WILDERNESS STUDY AREAS

ington, represents the single most popular recreation resource in the immediate study region because of its proximity to the communities of residence and its water-based resources. The reservoir has two developed areas with 145 campsites at Pines and Sims Mesa. Park officials have indicated that for the summer of 1981 the Pines Park was so popular that on peak weekends the park could not accommodate the demand (Findley 1981). A new campground is planned for completion in 1983 to help alleviate the current problems of overcrowding. Water-based recreation activities at the reservoir include swimming, boating, and fishing. The park had over 250,000 visitors in 1980.

Angel Peak, a BLM-developed recreation area, is 13 miles southeast of Bloomfield. The area is called the Nacimiento Badlands; the top 100 feet of Angel Peak, composed of hard sandstone, is the only part of the San Jose Formation remaining in the badlands area. The park has 16 family camping units and picnic units.

Bluewater Lake, more than 100 miles south of the Farmington area, is very popular and is currently experiencing overcrowding on peak weekends. The lake is suitable for boating, fishing, and swimming.

Chaco Culture National Historical Park is also within the area of influence for the proposed NMGS. Visits to the park from 1972 to 1980 increased by 57 percent. Visitation in 1981 totaled 77,000.

TRANSPORTATION

The study region encompasses the primary communities of residence for the proposed NMGS project and is physically defined by the major arterials that link the communities and provide access to the proposed NMGS plant site.

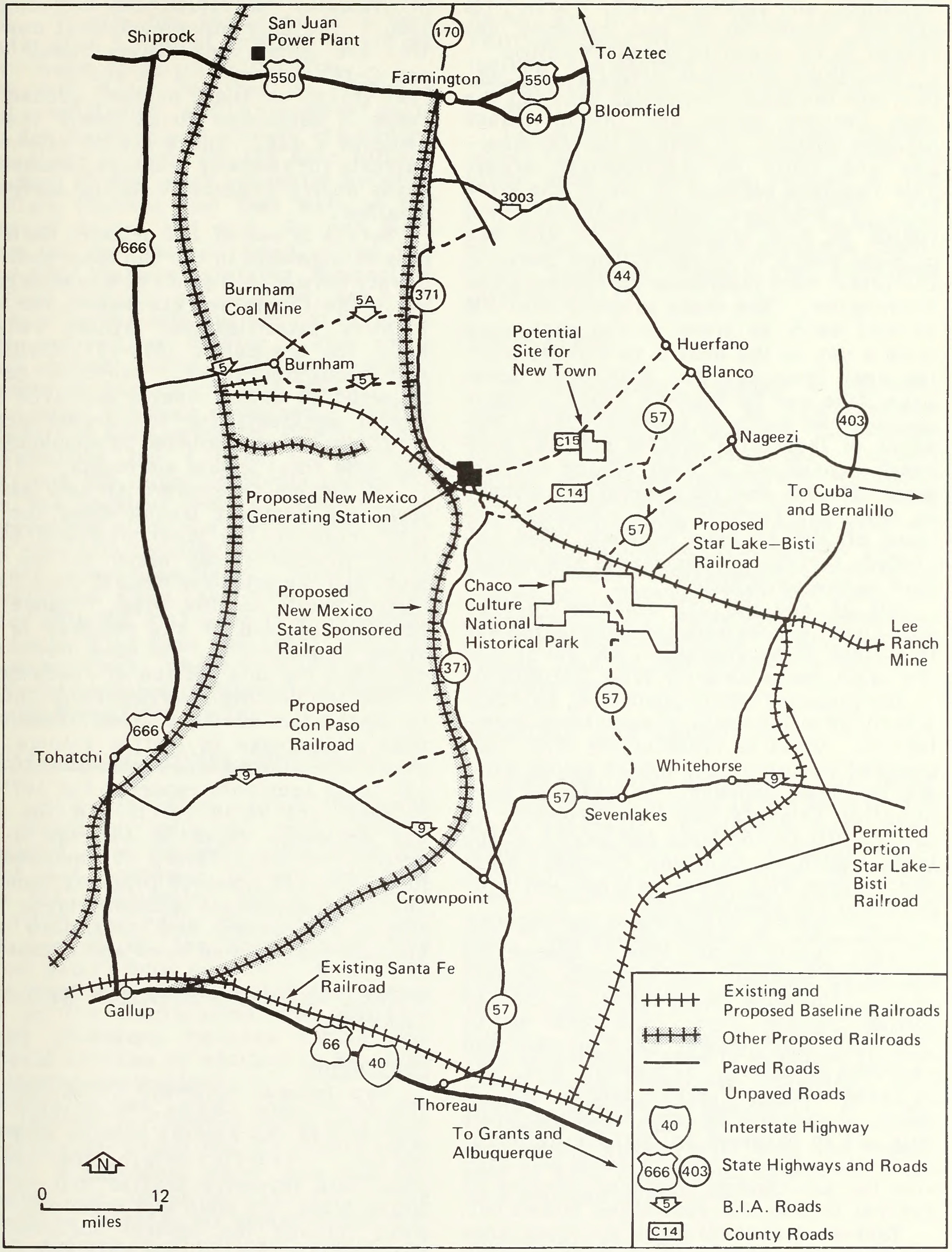
REGIONAL TRANSPORTATION

Regularly scheduled and contract transportation services within the area include air, bus, and trucked freight. There is presently no rail service available to the population centers in San Juan County; however, two rail lines are proposed and under discussion: the Star Lake spur, running north from the Santa Fe line to the proposed plant site; and the Con Paso Line, connecting just west of Gallup and running north (with a spur to the NMGS site) to just west of Farmington. For this analysis, both are assumed to be in operation by 1985. Of the two, only the portion of the Star Lake line serving the Lee Ranch has actually been approved by the Interstate Commerce Commission (ICC); the portion that could serve the NMGS site has ROW approval from BLM but has not been approved by the ICC.

Because rail service is not now available to the Four Corners region, the highway system is the major mode for moving goods, equipment, and people. Several state and federal highways serve the area (Map 2-5), but foundation, surface, and safety deficiencies plague some segments of almost every major roadway in the region. According to a 1981 New Mexico State Highway Department (NMSHD) report, some of these deficiencies will be remedied under a 5-year improvement plan. In response to the consequences of past energy resource development, the NMSHD has proposed or begun major new construction or renovation projects for all but one of the highways described below.

U.S. 550, a paved four-lane divided highway, traverses 57.1 miles of rolling terrain from Shiprock through Farmington and Aztec to the Colorado state line. Segments of U.S. 550 between Shiprock and Aztec are paved two-lane highway (2.7 miles), as are the 13.1 miles from Aztec north to the New Mexico-Colorado line. The NMSHD classifies U.S. 550 as a principal arterial that carries a high volume of commuter and service vehicle traffic (e.g., over 10,000 vehicles per day between Shiprock and Bloomfield in 1977). U.S. 550 is the primary access route between the residential population centers of San Juan County and several major employers, including the Four Corners Power Plant, the San Juan Generating Station, and the Utah International coal mine. (Construction of San Juan Unit 4 is scheduled for completion in 1982, thereby eliminating some commuter traffic.) A large volume of coal traffic is expected in the next 3 years, adding to the already high traffic levels.

The second principal east-west arterial is U.S. 64, which connects U.S. 550 from a junction in Farmington to NM 44 at a junction in Bloomfield, a distance of 12.2 miles over flat to rolling terrain.



Source: Modified from BLM 1982.

Map 2-5. MAJOR TRANSPORTATION ROUTES IN THE SAN JUAN BASIN

Although U.S. 64 carries a high volume of commuter and service vehicle traffic, its present configuration and capacity are judged to be adequate by the NMSHD.

The third principal arterial, NM 44, provides the main connection between the Four Corners region and the interstate highway system, as well as the Albuquerque and Santa Fe metropolitan areas. This two-lane highway is one of the more heavily traveled noninterstate rural routes in New Mexico. It is also the primary route to Chaco Culture National Historical Park from both Albuquerque and Farmington. The state projects that NM 44 will carry as many as 300 coal-truck trips a day in the next 1 to 3 years moving coal from the San Juan Basin (Star Lake Mine and La Ventana Mine) to Albuquerque and Santa Fe (NMSHD 1981). Because of increasing traffic volume, proposed expansions of coal mining activity along NM 44, and its general importance to the Four Corners area, various sections of NM 44 have recently been upgraded; further improvements are scheduled in the near future.

NM 57 and NM 371 combine to provide direct access between Farmington and Interstate 40 at Thoreau. NM 371 is also the main route directly from Farmington to the proposed NMGS plant site, approximately 35 miles south of downtown Farmington. About 40 miles of NM 57/371 are unpaved but graveled; the 66 paved miles are two-lane roadway. A series of construction projects has been proposed by the NMSHD to complete the paving of the total length of two-lane roadway; however, some 27.3 miles are not yet programmed for construction.

U.S. 666, a major arterial, is the primary north-south route connecting Gallup to Shiprock and the Four Corners area. Covering 90.4 miles of flat to rolling terrain from Interstate 40 to U.S. 550, this highway has four-lane and two-lane segments. At present, U.S. 666 is paved along its entire length, and 39 miles of resurfacing and widening projects are in progress to upgrade deficient segments. These projects would also provide for anticipated increased volumes of general traffic and coal-truck movement.

East-west connectors in the study area are also deficient. At present, Navajo 5A connects U.S. 666 and NM 371 from the Burnham Trading Post to 10 miles north of the proposed NMGS site. Approximately half of this road is lightly graded dirt, programmed for bituminous surfacing by 1990. The only other east-west connectors are unimproved county roads (C-15 and C-14) between NM 44 and 371. Current traffic on these narrow, graded dirt roads is estimated to be fewer than 20 vehicles a day. There are no ditches or culverts for roadway drainage, making the roads nearly impassable during inclement weather.

Safety is one of the primary deficiencies of highways in the San Juan-McKinley county network. These two counties ranked in the top three, statewide, for total highway fatalities per million vehicle-miles for the period 1974-1977 (Williams and McAllister 1979). San Juan County reported 60 annual deaths and 2719 total annual accidents for the 3-year period; McKinley County reported 73 annual deaths and 2464 total annual accidents.

Of particular concern to this assessment are accident trends along the primary road to the plant site--NM 57/371 from Thoreau (I-40) north to the Bisti site, and the proposed NM 371 from Farmington south to the site. Since the northern portion of the roadway is still under construction, no data have been collected for this portion of roadway.

For the southern portion from Thoreau to Bisti, the accident trend, consistent with a decrease in traffic volume, has shown a downward shift from 1979 to 1981 (87 total accidents reported for 1979, 73 in 1980, and 64 in 1981). Of the total 224 accidents reported for the 3-year period, 10 were fatal, 77 involved injury, and 137 involved property damage. The most prominent accident types were single roll-overs and collisions with animals (unattended cows and horses).

MUNICIPAL TRANSPORTATION AND TRAFFIC

Farmington

Two federal highways (U.S. 550 and U.S. 64, both principal arterials) feed traffic into the eastern portion of Farmington. Traffic originating locally joins this intercity traffic and is funneled along the Main and Broadway roadways through the central business district to U.S. 550 on the west side of the district. Since none of the major routes bypass the central business district, the combination of commuters and shoppers in

the downtown area frequently causes congestion on both the arterials and collectors. Traffic has increased at a rate greater than 5 percent annually on almost every major street in Farmington.

Several major construction, realignment, resurfacing, and improvement projects for Farmington's streets are underway or are planned for the near future, including an east-west connector between La Plata Highway and East Main at the north of town, and U.S. 64 and Main Street at the east of town. The Old Bloomfield Highway extension, connecting La Plata Highway and U.S. 64, has been proposed by the city but has not received state approval or funding. This route would connect eastern residential developments in Farmington with NM 371 and would avoid the main downtown. Traffic accidents in Farmington for 1980 produced 12 fatalities (up 4 from the previous year) and 920 injury accidents (down 492 from the previous year). Accidents at intersections along the two primary east-west corridors totaled 92 along Broadway and 390 along Main Street. Accidents at intersections along Lake Street (the connector with NM 371) were 13 at Broadway and Lake, 9 at Main and Lake, and 9 at Pinyon and Lake. There were 18 accidents at the intersection of Bloomfield Highway and Old Bloomfield Highway.

SOCIAL AND ECONOMIC CONDITIONS

A two-county study region (San Juan and McKinley counties) was initially identified for assessing the potential social and economic impacts resulting from the construction and operation of the NMGS, the water supply system, and that portion of the transmission line system within those counties. A separate assessment was completed that focused only on the transmission line corridors (which therefore included Cibola and Sandoval counties in addition to San Juan and McKinley counties).

Following the initial analysis of the potential project-related social and economic impacts within the two-county study region, a subcounty study area was delineated for detailed analysis. The study area includes all communities that would receive a significant portion of the project-related impacts. For the purposes of this project, the study area encompasses the cities of Farmington, Aztec, and Bloomfield; and the unincorporated communities of Flora Vista, Lee Acres, and the Lower Valley (Waterflow, Fruitland, and Kirtland). The area also includes the eastern portion of the Navajo Reservation and dispersed rural living areas within it.

Communities such as Shiprock, Crownpoint, and Thoreau were excluded from the study area because the results of the preliminary analysis indicated that project-related impacts would be negligible. (See the Social and Economic Conditions Technical Report for additional information.)

POPULATION

The study area contains a multicultural population that is characteristic of northwestern New Mexico. Three broad ethnic groups predominate: Anglos, Native Americans (principally Navajos), and Hispanic-Americans. Since the 1950s the study area has experienced fluctuations in population in response to regional energy exploration and development activities. Between 1985 and 2000, the population of the study area communities is projected to increase by 21.9 percent (rising from 65,650 in 1985 to 80,050 in the year 2000).

ECONOMY AND EMPLOYMENT

Between 1970 and 1980, the major sources of employment in San Juan County were services, wholesale and retail trade, and government. The majority of those jobs were located in the study area. During this period, total county employment increased by more than 17,800 jobs. The largest increases were exhibited by the county's largest employment sectors: services, contract construction, wholesale and retail trade, and mining. Over the next 20 years the economy in the study area is expected to continue to be relatively dependent upon energy resource development. It is anticipated that much of the growth during this period would result from the expansion of coal mining and associated coal-haul railroad operations.

PUBLIC FINANCES

During the 1980-81 fiscal year (FY), the City of Farmington's total revenues

were nearly $74.2 million and expenditures approached $51.4 million. The city had moderate surpluses in operating and enterprise funds, and a large surplus in the capital budget, which resulted mainly from the sale of $23.6 million in bonds. The city is expected to continue to generate substantial annual surpluses in the general fund between 1981 and 2000.

The City of Aztec also experienced a net surplus in FY 1981. Revenues were $3.4 million and expenditures were $3.2 million. The general fund surplus is expected to continue through FY 2000.

The City of Bloomfield had a slight deficit of approximately $62,000 in FY 1981, when revenues were $1.75 million and expenditures were $1.81 million. It is anticipated that the city could experience deficits in its operating budget throughout the rest of the century, ranging from $100,000 to $120,000 annually.

San Juan County's overall budget showed a deficit of over $400,000 in FY 1981. Total revenues were $13.2 million and expenditures were $13.6 million. It is expected that, because of its property tax base, the county's operating budget could exhibit a significant surplus during the next 20 years.

The Farmington Municipal School District received $18.0 million in revenues and spent $17.6 million in the 1980-81 school year. The district is expected to maintain an annual surplus of about $750,000 for noncapital funds through the year 2000.

During the 1980-81 school year, the Aztec Municipal School District experienced a slight budgetary surplus of $130,000. Revenues were $11.0 million and expenses were approximately $10.9 million. Aztec Municipal Schools are projected to have a small annual deficit (about $30,000) for noncapital funds through the year 2000.

Bloomfield Municipal School District's revenues for 1980-81 were $14.5 million, compared to expenditures of $9.1 million. During that year the district sold $5.2 million in bonds for school construction. Like the Aztec School District, Bloomfield has a relatively large property tax base to support a high level of operational expenses per pupil. The School District is expected to show an annual surplus of at least $880,000 per year in noncapital funds through the year 2000. The Central Consolidated School had revenues of $16.8 million and expenditures of $16.1 million in 1980-81.

HOUSING

The 1980 census indicated a total housing stock of 29,730 in San Juan County. The majority of these housing units are located in the study area communities. Between 1970 and 1981, the number of housing units in the study area more than doubled. During the same time period, the proportion of mobile homes and multifamily housing units increased, while the proportion of single-family detached units decreased.

While preliminary 1980 census data indicated a housing vacancy rate of 11.1 percent in Farmington, and up to 15 percent in some rural areas, local planners estimate much lower rates of around 2-3 percent. From projections of future development, without the Proposed Action, demand for housing is expected to increase fairly steadily from 1985 through the year 2000, with only occasional decreases in demand occurring in the study area.

Vacant residential land exists in the study area in sufficient quantities to accommodate the projected growth in housing demand. Moreover, the annual increases in housing demand projected for the study area are moderate compared with the 726-unit average annual addition to the housing stock in Farmington, Aztec, and Bloomfield between 1970 and 1981. However, if current high interest rates persist, it is probable that few additions to the supply of conventional single-family and multifamily housing would be made. This, combined with current low vacancy rates, could result in a shortage of those housing types, which could persist into the mid- to late 1980s.

MUNICIPAL SERVICES

An examination of the water supply systems in the study area indicated that peak day use for systems in Farmington, Aztec, and Bloomfield would remain below projected treatment capacities through the year 2000, although additional water rights would have to be purchased by each of those municipalities to meet projected

demand. With recent and planned system improvements, Farmington would have the capacity to treat wastewater through 1989 and Aztec and Bloomfield would have capacities to meet needs beyond the year 2000. Landfill sites identified for solid-waste disposal would be able to meet the area's needs for an estimated 15 years.

EDUCATION

Farmington Municipal School District facilities are currently overcrowded. Construction of new facilities has been prevented because recent school bond proposals have been rejected by local voters. At present, 44 portable classrooms are in use, and more must be purchased to accommodate the substantial projected growth in enrollment. For example, without the Proposed Action, it is estimated that enrollment would increase annually between 1985-86 and 1989-90, fluctuate into 1992-93, and rise during the remainder of the decade, resulting in an overall increase of approximately 2000 students. Farmington would continue to experience severe shortages of permanent facilities unless funds are obtained for new construction.

Aztec Municipal School District facilities had excess capacities in 1980-81, and a new high school is scheduled for construction in 1985. Schools in Bloomfield and in the Lower Valley area are operating close to capacity. A new elementary school is under construction in Bloomfield, and new facilities could be needed in Lower Valley as early as 1985.

Increased enrollments are projected for each of the above school districts through the year 2000, which would necessitate further staffing and facility expansions. However, Farmington is the only school district that was facing an acute facility shortage in 1980-81 as a result of difficulties in raising funds for necessary expansions.

HUMAN SERVICES

Human service agencies in San Juan County were operating at or near capacity in 1981. Increased demand for human services is anticipated in the 1980s, but the outlook for funding, especially for federal programs, is uncertain.

TRADITIONAL VALUES AND LIFESTYLES

Because Native Americans in the study region are workers, consumers of goods and services, and users of community facilities and services, they represent a substantial part of the larger community described in the assessment of social and economic conditions above. (For example, approximately 35 percent of the total San Juan County population is Native American [primarily Navajo]. In 1980, approximately 19,900 Native Americans were living in the "checkerboard area" adjacent to the Navajo Reservation.) The traditional values and lifestyles maintained by Navajos in the study region, however, are in some cases substantially different from those maintained by Anglo- and Hispanic-Americans in the region. An attempt was made, therefore, to evaluate traditional Navajo values and lifestyles in order to understand how the Proposed Action would potentially affect them. Information on the proportion of potentially affected Navajos who maintain traditional values and lifestyles was not available for this study. It was necessary, therefore, to qualify rather than to quantify statements regarding traditional values and lifestyles. In addition, it was assumed that at least some of the Navajos potentially affected by the Proposed Action do adhere to traditional values and lifestyles.

Navajo lifestyles and values today are widely diverse because of different levels of exposure and adaptation to other culture systems. Rapid population growth, depletion of the renewable resource base, increasing energy resource exploration, and development on lands traditionally occupied or used by Navajos, as well as better access to educational and employment opportunities in nontraditional settings, have contributed to increased acculturation.

It is impossible to document how many Native Americans in the affected environment still adhere to traditional values and lifestyles. Some individuals are highly acculturated and support continued energy resource development and expansion of the local economy in nontraditional ways. Others protest continued development because it violates some traditional beliefs and values. Most Navajos are attempting to adapt their lifestyles to

accommodate participation in the national wage economy while adhering to their traditional cultural values to the greatest extent possible. While a considerable amount of change in Navajo culture has occurred over the past few decades, the integrity of the Navajo culture core has been maintained. Elements such as the clan system, matrilineal descent, matrilocal residence patterns, extended-family cooperation, and traditional beliefs and values are still widely observed. While traditional Navajos today are much more mobile than their ancestors, they still have a strong sense of kinship networks. Even those who leave their "home" communities to work in urban areas return home frequently, and they provide support to relatives who follow more traditional economic pursuits, such as livestock grazing.

WATER SUPPLY SYSTEM

PROPOSED ACTION (35,000 Ac-Ft/Yr from the Navajo Reservoir [San Juan River])

HYDROLOGY

The geographic areas of influence for the Proposed Action were defined as (1) direct impacts, San Juan River; and (2) indirect effects, Colorado River. The San Juan River originates in southwestern Colorado and flows through northwestern New Mexico before leaving the state in the Four Corners area (Map 2-2). The San Juan River is tributary to the Colorado River at Lake Powell, Utah.

The Navajo Reservoir is the principal surface-water impoundment in the San Juan Basin. The Bureau of Reclamation has storage rights in Navajo Reservoir and would use those rights to supply the Navajo Indian Irrigation Project and other contracted water users, including the water supply proposed for NMGS. Additional reservoirs are planned as part of the Animas-La Plata project, which will have an effect on tributary inflows to the San Juan River in the vicinity of Farmington (Map 2-2).

Principal uses of water from the San Juan River and its tributaries are for irrigation, industrial supply (including power plant cooling), and municipal supply.

The average annual discharge (flow) of the San Juan River at Farmington has been about 2400 cubic feet per second (cfs). The average discharge of the San Juan River at Farmington that might be expected during a severe drought is about 700 cfs.

The availability of water from the San Juan River for uses in New Mexico is dependent on the physical supply and on institutional limitations. In operation studies of the San Juan River system, the Bureau of Reclamation estimated the physical availability of the supply upstream of Shiprock, New Mexico, to be 705,000 ac-ft/yr during a critical drought period. Estimates of the availability of water based on the institutional limitations of the Colorado River Compact, Upper Colorado River Basin Compact, and Mexican Treaty of 1944 are 647,000 ac-ft/yr (Bureau of Reclamation) and 727,000 ac-ft/yr (New Mexico Interstate Stream Commission).

WATER QUALITY

In general, the quality of water in the San Juan River between Bloomfield and Shiprock is good enough to protect the designated beneficial uses of the river in this reach. Designated beneficial uses of this part of the river include industrial water supply, irrigation, livestock and wildlife water supply, secondary contact recreation, marginal cold-water fishery, and warm-water fishery (New Mexico Water Quality Control Commission 1981). Beneficial uses below Shiprock are similar. Tributary inputs to the San Juan River in this area tend to degrade its quality. Consequently, levels of total dissolved solids (TDS) increase in the downstream direction (time-weighted average TDS of 266 mg/l at Bloomfield versus 449 mg/l at Shiprock). Both the composition and concentrations of dissolved solids in the San Juan River vary with flow. TDS concentrations tend to increase as flow decreases. Chemical composition generally shifts also; calcium carbonate dominates during high flow periods, and calcium sulfate dominates during medium and low flow periods. Concentrations of trace elements, iron, and manganese are high, although most of the trace elements are associated with suspended matter.

Suspended sediment concentrations are also very high.

ALTERNATIVE 1 (20,000 Ac-Ft/Yr from the San Juan River plus 15,000 Ac-Ft/Yr Ground Water)

HYDROLOGY

The geographic areas of influence for the alternative water supply were defined as (1) direct impacts: Westwater Canyon Member aquifer system in the San Juan Basin, San Juan River, Puerco River, Rio San Jose, Rio Salado (tributary of Jemez River), and springs in the Chuska Mountains near Crystal, New Mexico; and (2) indirect effects: areas fed by springs in Chuska Mountains.

The Westwater Canyon Member aquifer system is extensive throughout the San Juan Structural Basin; it consists of three aquifers (Dakota Sandstone, Westwater Canyon Member of the Morrison Formation, and Entrada Sandstone) and two confining layers (Map 2-6). The confining layers consist of the geologic units between the Dakota Sandstone and Westwater Canyon Member and between the Westwater Canyon Member and the Entrada Sandstone and are generally composed of rock types with relatively low permeability.

The aquifers are confined, except in outcrop areas around the margins of the basin where recharge takes place. As is characteristic of confined aquifers, water levels in wells that tap these aquifers are above the top of the aquifers. A number of wells that are completed in the Westwater Canyon Member are flowing. The depth to these aquifers throughout the San Juan Structural Basin is a function of location; the aquifers dip gently from the outcrop areas toward the center of the basin, where they may lie more than 5000 feet below the ground surface (Map 2-7). Discharge from the Westwater Canyon Member aquifer system takes place from pumping of wells and from contributions to surface and subsurface flow in the Puerco River, San Juan River, Rio San Jose, Rio Puerco, and Rio Salado.

Springs emerge from the Chuska Sandstone where it overlies the Westwater Canyon Member in the vicinity of Crystal, New Mexico (Chuska Mountains). This area probably is a recharge area for the Westwater Canyon Member aquifer system.

The principal use of ground water from the Westwater Canyon Member aquifer system has been the dewatering of uranium mines. Other present and projected uses are domestic and community water supply, livestock watering, mining and milling, mine reclamation, and power plant cooling.

WATER QUALITY

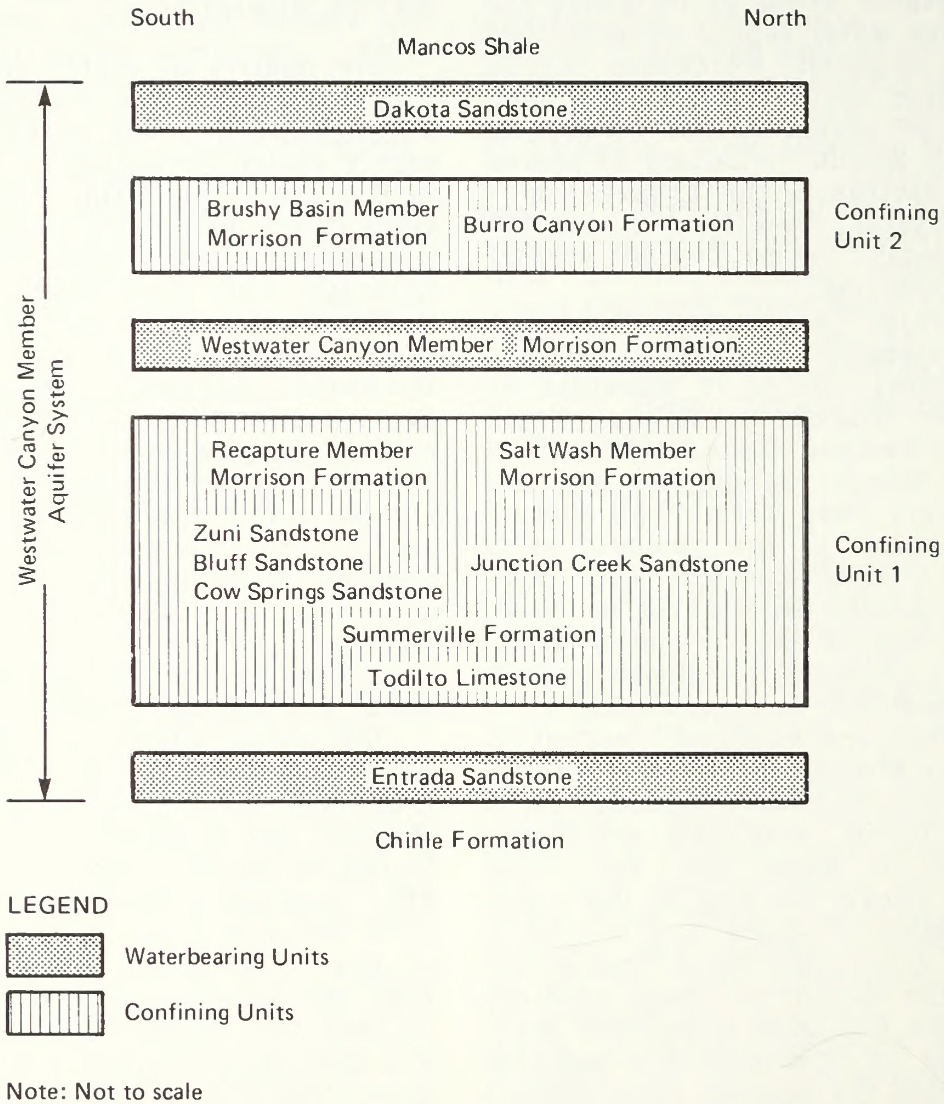
The quality of water in the aquifers that would be used for or affected by withdrawal for an alternative water supply varies according to location within the San Juan Basin. TDS concentrations in the Westwater Canyon Member of the Morrison Formation range from less than 500 mg/l in or near recharge areas in the southwestern part of the basin to more than 4000 mg/l near the center of the basin. Analysis of ground water from the Apache Foshay test well (the well nearest to the proposed well field that penetrates the Westwater Canyon Member) yielded a TDS concentration of about 4500 mg/l. Water from this well generally exceeds water quality criteria for most beneficial uses (including irrigation and livestock watering) and would require treatment before its use as boiler feedwater and cooling water.

The water quality in the Dakota and Entrada sandstones is generally poorer than that found in the Westwater Canyon Member, but it generally follows the same trends within the San Juan Basin (i.e., TDS concentrations generally increase with distance from the southern outcrop of the formations). Analysis of water from the Apache Foshay test well indicated that TDS concentrations in the Dakota and Entrada sandstones near the site were about 6000 and 15,000 mg/l, respectively. As with the water from the Westwater Canyon Member, water from the Dakota and Entrada sandstones would generally not be suitable for most beneficial uses and would require treatment before its use as boiler feedwater or cooling water.

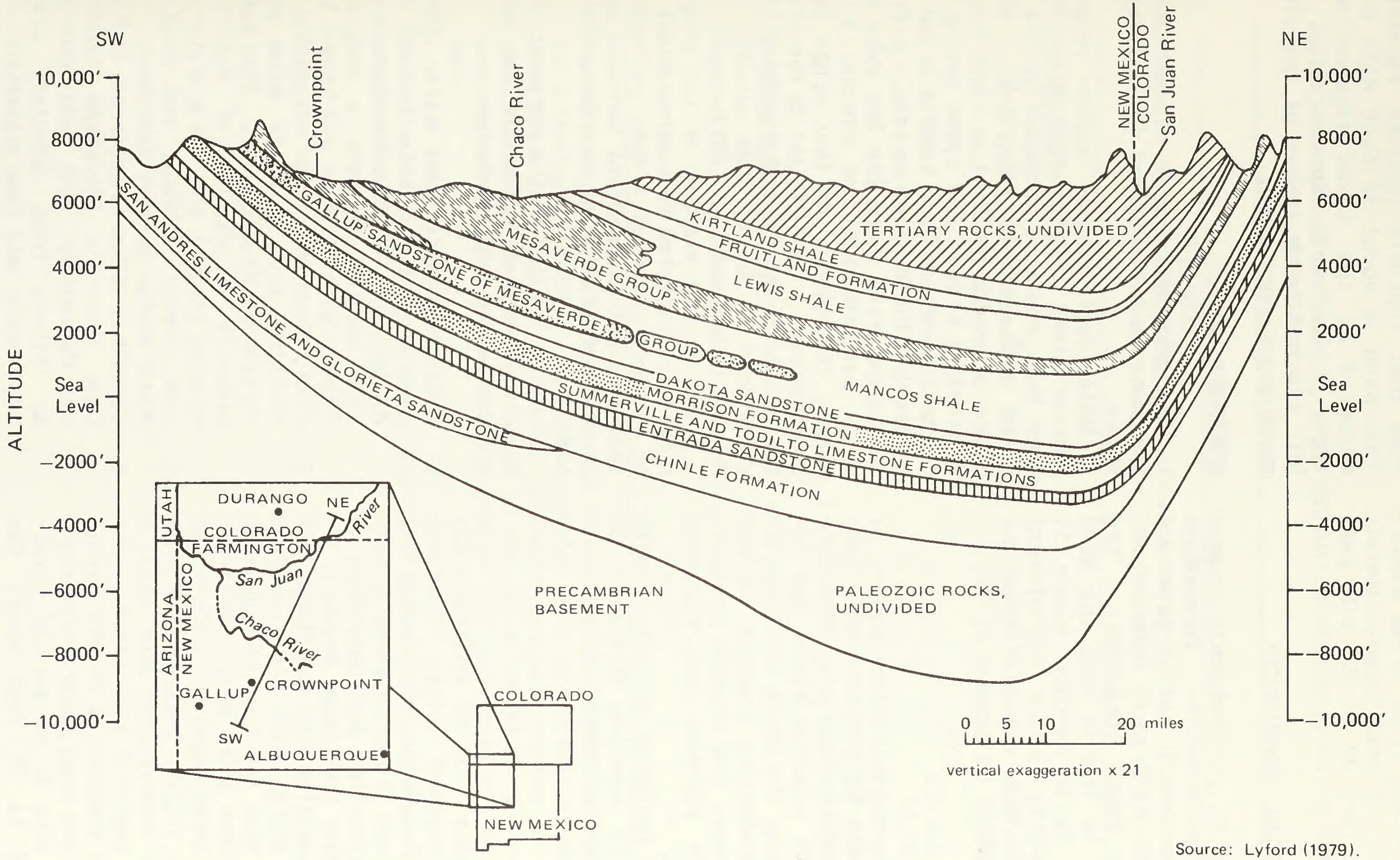
PROPOSED INTAKE STRUCTURE AND PIPELINE P1

MINERAL RESOURCES

Extensive deposits of gravel are present along the San Juan River and its major tributaries, in or near the general



Map 2-6. STRATIGRAPHIC SEQUENCE OF THE WESTWATER CANYON MEMBER AQUIFER SYSTEM



Source: Lyford (1979).

Map 2-7. GENERALIZED GEOLOGIC SECTION SHOWING MAJOR AQUIFERS (PATTERNS) IN THE SAN JUAN BASIN

vicinity in which the proposed water intake would be located. The proposed P1 pipeline route would cross areas underlain by deposits of coal (approximately from mileposts [MP] 30 to 35) oil, gas, and baked shale.

PALEONTOLOGICAL RESOURCES

The proposed P1 pipeline route crosses paleontologically sensitive formations along its entire length but is generally located 10 to 15 miles away from important scientific fossil localities. The only exception to this is near the Bisti Trading Post, in a locality where 17 fossils, including some significant specimens, have been reported from the Fruitland Formation (mileposts 31-33).

SOILS

Table 2-8 summarizes those aspects of the existing soils environment that may contribute to reclamation problems along the proposed P1 pipeline route and intake. Soils along the route are generally not very productive because of low available moisture, low organic content, and undesirable physical and chemical characteristics.

The surface facilities associated with the proposed P1 pipeline (including in take) would not be located on prime or unique farmland.

VEGETATION

The geographic area of influence for P1 and the proposed intake structure includes a 90-foot-wide area along the pipeline route and the area directly disturbed by construction and operation of the intake facility (including access).

The intake location and the floodplain surrounding it differ from other project components in that the location supports riparian vegetation (Map 2-8). Riparian vegetation is considered an important resource in the region because the type is limited and constitutes less than 1 percent of the regional vegetation. The proposed intake location is on the southern bank of the San Juan River near Farmington. This site is on an old floodplain about 10 to 20 feet above the average river level. The river has cut into this elevated bank, thus leaving a very narrow zone of subirrigated, and occasionally flooded, land at an elevation that supports riparian vegetation. This band is about 30 feet wide and is occupied by the mixed riparian scrub type, predominantly Russian olive. Uphill and behind it, most of the site is shrub-grass vegetation.

WILDLIFE

The geographic area of influence is the same as that defined for vegetation, above.

Mule deer crucial winter range is located along the San Juan River in the area that would be occupied by the proposed intake and P1 (Map 2-8). Winter range is crucial to herd survival because it provides browse and cover during winter months when other habitat is not able to provide these requirements. Although the large areas along the San Juan River have been designated crucial winter range, the quality of that range is not homogeneous. The habitat in the area of the proposed intake and pipelines is not considered to be of high quality (New Mexico Game and Fish 1982).

Deer in the vicinity of the proposed intake are reported to number about 300, an average of about 1 deer per section. Densities and populations increase during severe winters (New Mexico Game and Fish 1982).

Aquatic habitat in the segment of the San Juan River between Navajo Dam and the proposed intake site includes:

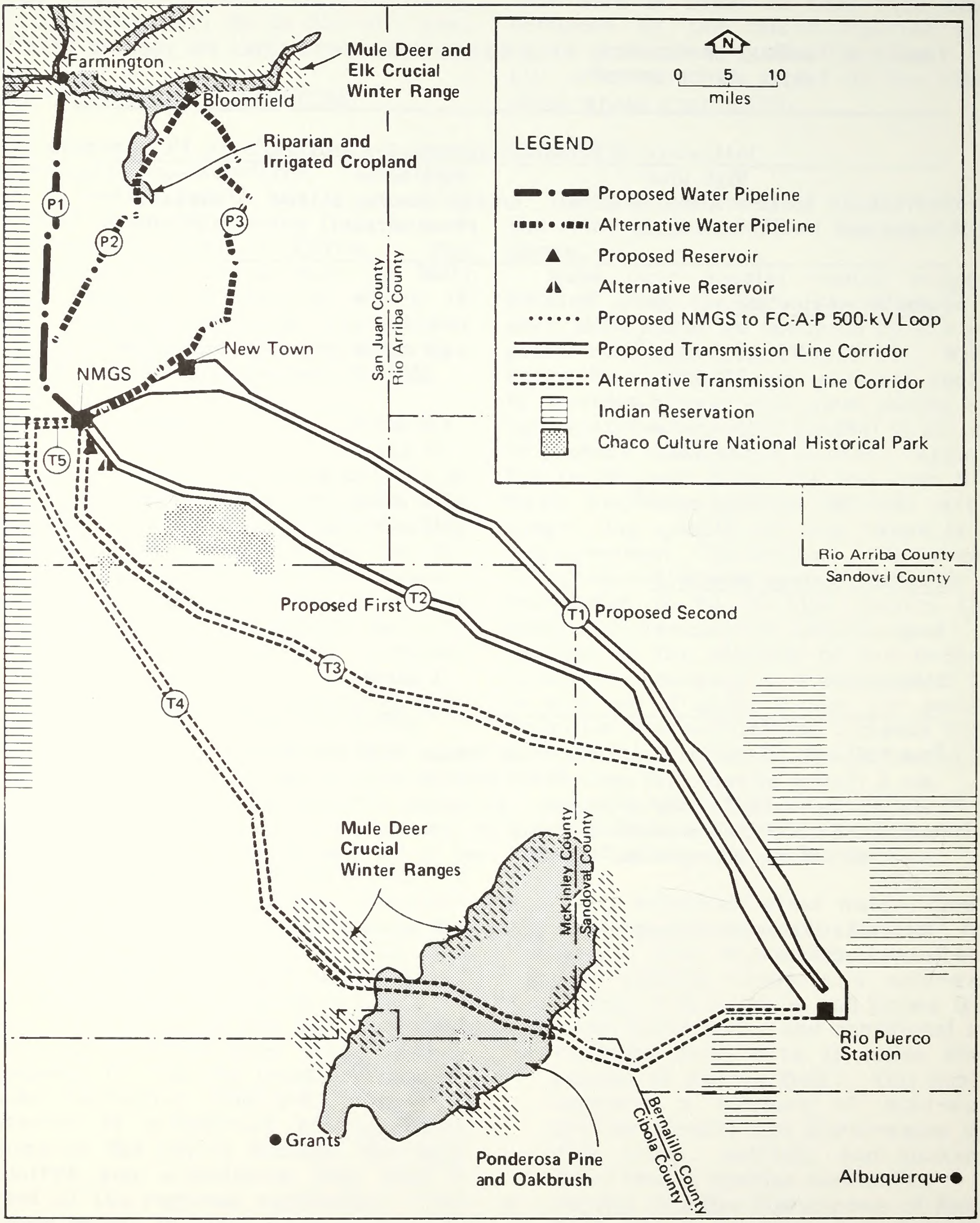
- Cold, relatively clear water, flowing over a gravel-rubble bottom from Navajo Dam to 8 miles downstream. This habitat supports a cold-water fishery with rainbow and brown trout.
- Cool, clear water and occasional high turbidity from 8 to 18 miles downstream of Navajo Dam. This habitat supports a mixture of cold-water species (trout) and warm-water species (carp, catfish, and suckers). Warm-water species dominate.
- Beyond 18 miles downstream of Navajo Dam there is increased turbidity, silt deposition, and heat absorption as inflows from tributary canyons continually add fine materials. This habitat supports a warm-water fishery with carp, catfish, and suckers.

Table 2-8. SUMMARY OF POTENTIAL SOILS RECLAMATION PROBLEM AREAS FOR THE WATER SUPPLY SYSTEM[a]

Project Component	High Wind Erosion Susceptibility (% of total)	High Water Erosion Susceptibility (% of total)	Steep Terrain (% of total)
	Indicators of Potential Reclamation Problems		
Main Water Pipeline			
P1	31.7 miles[b] (79.8%)	1.6 miles (4%)	1.35 miles (3.4%)
P2	28.4 miles[b] (66.7%)	2.6 miles (6.1%)	2.0 miles (4.7%)
P3	34.0 miles[b] (70%)	3.6 miles (7.4%)	2.3 miles (4.7%)
Terminal Storage Reservoir			
Proposed	35 acres	--	--
Alternative	--	4 acres	--

[a]See Table 10 in the Soils and Prime and Unique Farmlands Technical Report for a listing of potential reclamation problem areas by map unit or soil association and mileposts or acreage (including pertinent comments and potential mitigation measures). Table 10 also lists (or refers to) data sources, and the approach and criteria used in the compilation of this table.

[b]Each mile traversed corresponds to about 10.9 acres of the pipeline construction ROW.



Source: BLM 1982.

Map 2-8. AREAS OF CRUCIAL WILDLIFE HABITAT AND UNIQUE VEGETATION

(The proposed and alternative intakes would be located in this stretch of river, approximately 20 and 30 miles downstream of the Navajo Dam, respectively.)

THREATENED AND ENDANGERED SPECIES

The geographic area of influence is the same as that defined for vegetation, above.

Only the species that may be affected by P1 and the proposed intake structure, based on analysis, are discussed below.

Bald Eagle

Although no bald eagle nests or roosts have been reported near the proposed intake, the bald eagle is common along the San Juan River and near Navajo Reservoir during winter months and migration periods.

Colorado Squawfish

Construction of the Navajo Reservoir, water depletions, and irrigation flow returns have probably resulted in the extirpation of the Colorado squawfish in the vicinity of the proposed intake site (FWS 1977). The most recent collection in the vicinity of the proposed intake was near Bloomfield in 1965. The recent presence of the Colorado squawfish in New Mexico is unconfirmed, despite intensive surveys in the San Juan River drainage in the middle and late 1970s.

Mesa Verde Cactus

Potential habitat for Mesa Verde cactus occurs in the area of influence (90-foot ROW) for P1 (New Mexico Heritage Program 1982). Potential habitat includes areas within the Kirtland and Fruitland formations.

Devil's Claw Cactus

Sclerocactus whipplei, variety heilli, occurs in extreme northern San Juan County. No plants or potential habitat are reported south of the San Juan River.

CULTURAL RESOURCES

Only a small sample of the study area for P1 has been surveyed to identify the cultural resources there. No such survey has been conducted at the proposed intake structure site. In the surveyed localities, 71 archaeological and historic sites have been recorded. Most of these appear to be of Archaic or Navajo cultural affiliation; none are protected Chacoan resources.

Areas of significance to traditional Native American religious values have previously been identified.

VISUAL RESOURCES

The geographic area of influence is defined as an area 3 miles wide along the pipeline route.

The scenic quality, sensitivity, and VRM classes for the proposed intake and P1 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along proposed water pipeline P1. Location with respect to WSAs is also described in Table 2-7 and shown on Map 2-3.

ALTERNATIVE INTAKE STRUCTURE AND PIPELINE P2

MINERAL RESOURCES

Pipeline P2 would cross areas underlain by coal deposits (approximately MP 32-37).

PALEONTOLOGICAL RESOURCES

Pipeline corridor P2 would cross paleontologically sensitive formations along its entire length, but it is generally located 5 to 10 miles away from important scientific fossil localities.

SOILS

Table 2-8 summarizes the aspects of the existing soils environment that may contribute to reclamation problems at the alternative intake facility and along the P2 alternative route. Soils along this route are generally not very productive, although P2 traverses approximately 10 miles of productive agricultural land within the Navajo Indian Irrigation Project.

HYDROLOGY/WATER QUALITY

See the hydrology and water quality discussions for the Proposed Action, above.

VEGETATION

The area of influence for this alternative is the same as that described for the proposed intake and P1, above. The alternative intake site is on the southern bank of the San Juan River near Bloomfield (Map 2-8). The large sandbar island and a 60-foot-wide zone along the bank are covered by the mixed riparian scrub type, including sandbar willow, Russian olive, tamarisk, rabbit-brush, and cottonwood seedlings. The majority of the floodplain above the cutbank is irrigated fields with large isolated cottonwoods.

WILDLIFE

Mule deer crucial winter range is located in the vicinity of the alternative intake and P2 (Map 2-8). Habitat quality and mule deer populations are the same as those discussed for P1. Aquatic resources are essentially the same as those discussed for P1 and the proposed intake.

THREATENED AND ENDANGERED SPECIES

See the discussion for P1 and the proposed intake.

CULTURAL RESOURCES

Only a small sample of these proposed project areas has been surveyed to identify the cultural resources there. No cultural resource survey has been conducted at the alternative intake structure site. In the surveyed P2 study area localities, 79 archaeological and historic sites have been recorded. Most of these appear to be of Archaic or Navajo cultural affiliation, and none are protected Chacoan resources. No areas of significance to traditional Native American religious values and practices have been identified within the P2 study area.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for the alternative intake and pipeline P2 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along alternative water pipeline P2 and the alternative intake. Location with respect to WSAs is also described in Table 2-7 and shown on Map 2-3.

ALTERNATIVE INTAKE STRUCTURE AND PIPELINE P3

GEOLOGIC SETTING

Steep-sided slopes and landslide potential exist along P3 in Kutz Canyon near Bloomfield.

MINERAL RESOURCES

Pipeline P3 would cross areas underlain by coal deposits (MP 41.5-46.0).

PALEONTOLOGICAL RESOURCES

The P3 corridor would cross exposures of the Nacimiento Formation in Kutz Canyon that have yielded a rich assemblage of significant fossils, including some of the earliest known primates. This area is classified as having high paleontological sensitivity. Kutz Canyon is currently a focal point of important paleontological research. The remainder of the proposed P3 route (60 percent) crosses areas of moderate paleontological sensitivity.

SOILS

Table 2-8 summarizes those aspects of the existing soils environment that may contribute to reclamation problems along P3.

WILDLIFE

Mule deer crucial winter range is located in the San Juan River valley in the vicinity of the alternative intake and P3 (Map 2-8). Habitat quality and mule deer populations are the same as those discussed for P1.

THREATENED AND ENDANGERED SPECIES

See the discussion for P1.

CULTURAL RESOURCES

In the surveyed P3 study area localities, 64 archaeological and historic

sites have been recorded. Most of these appear to be of Archaic or Navajo cultural affiliation. Some are of significance in Anasazi-Chacoan studies. The proposed P3 study area crosses the prehistoric Chacoan Great North Road twice, and also includes the Twin Angels (or Kutz Canyon) site that is an Archaeological Protection Site designated by the Chaco Culture Preservation Act. No sites of traditional Native American importance have been identified in the P3 study area.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for the P3 route are summarized in Table 2-7.

PROPOSED TERMINAL STORAGE RESERVOIR

SOILS

Table 2-8 summarizes those aspects of the existing soils environment that may contribute to reclamation problems at the proposed terminal storage reservoir site (R1).

The proposed reservoir site does not contain any prime or unique farmland.

ALTERNATIVE TERMINAL STORAGE RESERVOIR

See the discussion for the proposed reservoir, above.

TRANSMISSION SYSTEM

PROPOSED TRANSMISSION LINE T1

GEOLOGIC SETTING

Proposed transmission line T1 would cross the Rio Puerco Fault Belt near the Rio Puerco Station (see the Geologic Setting Technical Report). One or more active fault traces are probably present.

MINERAL RESOURCES

T1 would cross strippable coal deposits and baked shale in the Bisti Fruitland (approximately MP 0-4.5), Star Lake Fruitland (approximately MP 53.559), and La Ventana Mesaverde (approximately MP 75.0-77.5) coal areas. Route T1 would also cross several uranium prospects.

PALEONTOLOGICAL RESOURCES

T1 would cross approximately 50 miles of intermittent exposure of the Nacimiento Formation. These exposures have been the subject of paleontological study for nearly 70 years, are of current research interest, and have yielded large numbers of significant fossils. T1 passes directly across or within 1 mile of a number of important localities, including the famous Mammalon Hill and Kimbeto sites.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T1 route. Soils along the route are generally not very productive because of low available moisture, low organic content, and undesirable physical and chemical characteristics.

The surface facilities associated with T1 would not be located on prime or unique farmland.

WILDLIFE

The geographic area of influence was defined as an area 200 feet wide along all proposed and alternative transmission line routes.

Wildlife resources in the geographic area of influence for T1 are similar to those described for the plant site. Locations of raptor nests and general discussions for other wildlife species are provided in the Wildlife and Aquatic Biology Technical Report.

CULTURAL RESOURCES

A moderate portion of the T1 study area has been surveyed to identify the cultural resources there. In the surveyed localities, 164 archaeological and historic resources have been recorded. Most of these appear to be of Navajo or Anasazi cultural affiliation; Archaic materials are also identified there. The T1 study area crosses the prehistoric Chacoan Great North Road and is immediately adjacent to Pierre's site, a

Table 2-9. SUMMARY OF POTENTIAL SOILS RECLAMATION PROBLEM AREAS IN TRANSMISSION LINE STUDY AREAS[a]

	Indicators of Potential Reclamation Problems		
	High Wind Erosion Susceptibility (% of total)	High Water Erosion Susceptibility (% of total)	Steep Terrain (% of total)
Transmission Line Study Areas			
T1	56.6 miles[b] (52.4%)	23.5 miles (21.8%)	--
T2	37.3 miles (36.9%)	32.0 miles (31.7%)	--
T3	47.0 miles (44.3%)	22.75 miles (21.5%)	--
T4	50.0 miles (40.3%)	23.25 miles (18.8%)	8.75 miles (7.1%)
T5	5.0 miles (100%)	--	--

[a]See Table 10 in the Soils and Prime and Unique Farmlands Technical Report for a listing of potential reclamation problem areas by soil association and mileposts (including pertinent comments and potential mitigation measures). Table 10 also lists (or refers to) data sources, and the approach and criteria used in the compilation of this table.

[b]Each mile traversed corresponds to about 24.2 acres of the transmission line construction ROW.

protected Chacoan site. In addition, the study area includes at least 5 resources of traditional Native American value: the Great North Road, an antelope corral, a spring, and 2 ceremonial sites.

VISUAL RESOURCES

The geographic area of influence was defined as 5 miles on each side of all proposed and alternative transmission line routes.

The scenic quality, sensitivity, and VRM classes for T1 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along T1.

WILDERNESS VALUES

The Ojito WSA is located approximately 5 miles southwest of the village of San Ysidro in T15N, R1W and R1E. The T1 study area encompasses the far western portion of the Ojito WSA.

This 11,200-acre WSA consists of steep and rocky terrain cut by several steep canyons. It is bounded on the north by property boundaries, on the west by a powerline ROW, on the south by a combination of county-maintained road and gas pipeline ROW, and on the east by a combination of maintained road and ridgeline.

Several earthen dams are well buffered by the steep and rocky terrain, thus leaving these intrusions substantially unnoticeable. There is no external intrusion at this WSA.

The combination of the rocky, rugged terrain and few intrusions provides the opportunity for solitude. Outstanding opportunities for primitive and unconfined types of recreation also exist.

Supplemental values are provided by the abundance of prehistoric and historic sites and paleontological resources, as well as high-quality scenic values.

PROPOSED TRANSMISSION LINE T2

PALEONTOLOGICAL RESOURCES

The northwestern half of T2 lies very near the irregularly shaped lower boundary of the Fruitland Formation, where it intermittently crosses Fruitland exposures. Near the proposed plant site the route crosses about 1 mile of Fruitland Formation where no fossil occurrences have been reported, but where adjacent distributions indicate that such occurrences are somewhat likely. Approximately 25 miles of T2 cross more or less continuously over the Fruitland Formation, from lands mapped on the Fire Rock Well USGS topographic sheet quadrangle into those of the Star Lake USGS sheet. A number of occurrences have been reported in or within 1 mile of T2, although they include few significant fossils. Over the rest of its length, T2 passes over areas of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T2 route. Soils are generally not very productive, as discussed for T1.

THREATENED AND ENDANGERED SPECIES

The geographic area of influence was defined as an area 200 feet wide along all proposed and alternative transmission line routes.

Black-footed Ferret

The last black-footed ferret collected in the area of proposed project components (McKinley County) was in 1940. No reliable sightings have been recorded in recent years. Recent surveys have also failed to record any verified sightings or collections. Potential black-footed ferret habitat (prairie dog towns) is limited to several locations along T2 (MP 0-10, MP 30-40).

CULTURAL RESOURCES

A relatively small portion of the T2 study area has been surveyed to identify the cultural resources there. In the surveyed localities, 73 archaeological and historic resources have been recorded. Most of these appear to be of Navajo affiliation, although there are a few significant Anasazi resources there. The T2 area of influence crosses and is immediately adjacent to, or even coincident with, the Northern Addition and Pueblo Pintado elements of Chaco Culture

National Historical Park. Three Chacoan outlier sites (Greasy Hill, Escavada Complex, Kin Indian Ruins) not within the park or having special protection status, but recommended by the State Historic Preservation Officer to be eligible for the National Register of Historic Places, are within or adjacent to the T2 study area. The Raton Well protection site is within a mile of that study area, and the proposed T2 corridor also crosses preliminarily identified Chacoan roads or road spurs. In addition, at least 3 sites important to traditional Native American values have been identified within the T2 study area: the Black Lake offering point, a sacred canyon, and a plant gathering area.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for T2 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes along T2.

WILDERNESS VALUES

The Cabezon WSA is located approximately 15 air miles due west of San Ysidro, in T16N, R3W and R2W; and T15N, R2W. The Cabezon WSA is 7235 acres and consists of a volcanic plug 8000 feet high that is surrounded by rolling hills cut by a network of arroyos. The T2 area of influence overlaps the eastern portion of this WSA between mileposts 75 and 80. The eastern boundary is currently bounded by a powerline ROW (NM559354) and an unimproved dirt road.

The unique geology of the Cabezon WSA provides an outstanding opportunity for those who choose to climb the peak itself or wander among the foothills. The peak provides a topographic buffer that allows users to avoid the sights and sounds of others. It also offers an excellent panoramic view, unavailable from other perspectives, of surrounding landscapes.

Cabezon offers the opportunity for primitive and unconfined recreation. The area offers an opportunity for sightseeing and photography related to scenic, geologic, and cultural values. Cabezon is a unique geologic feature and has two prehistoric shrines on top of the peak; thus Cabezon also offers educational and scientific supplemental values.

<u>ALTERNATIVE TRANSMISSION LINE T3</u>

MINERAL RESOURCES

T3 would cross strippable coal deposits and baked shale in the Chaco Canyon Upper Menefee (approximately MP 2.5-4.5) and Bisti Fruitland (approximately MP 0-2.5) coal areas.

PALEONTOLOGICAL RESOURCES

T3 would cross about 1 mile of the Fruitland Formation immediately south of the proposed plant site. Two nonsignificant fossil occurrences have been reported there. The remainder of T3 would cross regions of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to soil reclamation problems for the T3 route. Soils are generally not very productive, as discussed for T1 and T2.

THREATENED AND ENDANGERED SPECIES

<u>Black-footed Ferret</u>

Potential black-footed ferret habitat (prairie dog towns) is limited to one area on T3 (MP 0-10).

CULTURAL RESOURCES

A relatively small sample of the study area for T3 has been surveyed to identify the cultural resources there. In the surveyed localities, 51 archaeological and historic resources have been recorded. Two of these appear to be Paleo-Indian sites, while the rest are generally of either Archaic, Anasazi, or Navajo cultural affiliation. The Chacoan outlier Casa Patricio, presumed eligible for the National Register of Historic Places, is within the T3 study area, and that unit also crosses 4 possible Chacoan roads. Three other Chacoan sites (Lake Valley, Kin Bineola, Upper Kin Klizhin) are located within 500 to 3000 feet of

the T3 study area. In addition, 3 sites important to traditional Native American values have been identified within the T3 study area: a sacred mesa, an abandoned hogan, and an abandoned camp that may have an associated grave.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for T3 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes encompassed by T3.

ALTERNATIVE TRANSMISSION LINE T4

MINERAL RESOURCES

T4 would cross strippable coal deposits and baked shale of the Newcomb Upper Menefee and Chaco Canyon Upper Menefee areas. T4 also passes through the Grants uranium region and passes near a number of uranium prospects and underground mines.

PALEONTOLOGICAL RESOURCES

T4 crosses about 3 miles of the Fruitland Formation immediately west of the proposed plant site. Thirteen occurrences of scientifically significant fossils have been reported along the study area's southern edge here. The remainder of T4 crosses areas of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T4 route. Soils are generally not very productive, as discussed for T1, T2, and T3.

VEGETATION

The geographic area of influence was defined as a 200-foot-wide area along all proposed and alternative transmission line routes.

T4 and the region surrounding it differ from the other project components in that it crosses higher-elevation lands supporting Ponderosa pine, pinyon, and occasional Douglas fir and aspen. Most of these forest sites are noncommercial. Total average annual usable forage production in the region surrounding T4 is approximately 94,353 AUMs.

WILDLIFE

Elk habitat is present along T4 between MP 64 and 96. Mesa Chivato is considered permanent habitat; San Mateo and La Jara Mesa are considered crucial winter habitat. The San Mateo herd is estimated at several hundred animals, while the Mesa Chivato herd is estimated at 15 to 20 animals. Approximately 12 miles of crucial winter habitat would be traversed between MP 65 and 75, and MP 93 and 95 (Map 2-8).

Mule deer are present in areas covering approximately 75 percent of T4. The heaviest concentrations are reported along the continental divide, on Mesa Chivato, Mesa San Luis, the La Ventana area, and Mt. Taylor. The Mt. Taylor area supports approximately 500 animals; all other areas combined support 750 deer year-round and 1160 during the winter. Mule deer are generally concentrated in wooded areas, except when heavy snows occasionally force them to lower-elevation grasslands. Two areas of crucial winter habitat would be traversed by T4: MP 65 to 75, and MP 93 to 95 (Map 2-8).

THREATENED AND ENDANGERED SPECIES

Mesa Verde Cactus

Potential habitat for Mesa Verde cactus occurs in the area of influence for T4 (New Mexico Heritage Program 1982).

CULTURAL RESOURCES

A moderate portion of the T4 study area has been surveyed to identify the prehistoric and historic resources there, and the survey for sites of traditional Native American value has been relatively comprehensive. In the archaeological and historic survey localities, 156 resources have been recorded. These are primarily of Anasazi cultural affiliation, though there are also numerous Navajo and Archaic sites identified there. The T4 study area may cross up to five prehistoric Chacoan road segments, and the Kin Bineola element of Chaco Culture National

Historical Park is within 2500 feet of the study corridor. In addition, inventory of the traditional religious resources has identified White Rock as a site of religious sifgnficance within the T4 study area, and 2 Navajo burials may be located there.

VISUAL RESOURCES

The scenic quality, sensitivity, and VRM classes for T4 are summarized in Table 2-7. Map 2-3 illustrates the region of influence and visual resource ratings for landscapes encompassed by T4.

TRANSMISSION LINE T5

PALEONTOLOGICAL RESOURCES

T5 would cross about 3 miles of the Fruitland Formation immediately west of the proposed NMGS site. Thirteen occurrences of scientifically significant fossils have been reported along this portion of the T5 study area. The remainder of this corridor is in areas of low paleontological sensitivity.

SOILS

Table 2-9 summarizes those aspects of the existing soils environment that may contribute to reclamation problems for the T5 route.

THREATENED AND ENDANGERED SPECIES

Mesa Verde Cactus

Potential habitat for Mesa Verde cactus occurs in the area of influence for T5 (New Mexico Heritage Program 1982).

RIO PUERCO STATION

GEOLOGIC SETTING

There are active fault traces of the Rio Puerco Fault Zone in the immediate vicinity of the proposed Rio Puerco Station location.

NMGS 3

Chapter 3

ENVIRONMENTAL CONSEQUENCES

Impact assessments were conducted for all resources described in Chapter 2. Potentially significant impacts are identified based on the indicators of significance developed for each resource topic. This EIS focuses on significant impacts, which are discussed in greater detail than impacts of less significance. Other nonsignificant impacts have been identified and documented in the technical reports for each resource topic. The analytic indicators of significance of impacts are discussed in this chapter. Technical reports are available at the BLM New Mexico State Office, Albuquerque District Office, Farmington Resource Area Office, and at other locations listed in Chapter 4.

Issues and potential impacts of each environmental topic were evaluated to determine if they in turn might have an effect on other topics. For example, removal of vegetation in a pipeline ROW would affect the soils resource; an increase in recreational use of certain areas may have an effect on sensitive paleontological resources.

Discussions of impacts are presented under headings for the generating station, the water supply system, and the transmission system. In addition, separate headings are used where differences in impact are expected during the construction phase and the operation, maintenance, and abandonment phases of project implementation. Discussion of impacts is not repeated where impacts would be similar to those for project components that have already been discussed; instead, these similar impacts are summarized in the alternatives section of Chapter 1.

NEW MEXICO GENERATING STATION

AIR QUALITY

Air quality impacts due to NMGS would be defined as significant when concentration increases added to the appropriate background levels would exceed the applicable state and national ambient air quality standards. These standards provide levels that are considered by the U.S. EPA to represent concentration levels below which human health and general welfare are not endangered. As such, they are used in this analysis as indicators of impact significance. The state and national standards are presented in Table 3-1. This table includes EPA's PSD (Prevention of Significant Deterioration) increment limits for Class I and II areas. They are presented here as a benchmark only with which to compare the concentration increases due to NMGS alone. As discussed in further detail in the Air Quality Technical Report, a PSD analysis is not conducted as part of this EIS. Such an analysis is specific to the requirements of PSD review. Under PNM's current schedule, a PSD permit application would be submitted in October 1983. However, this date may change if other components in the project schedule are altered.

Currently there are no cause-and-effect relationships between coal-fired power plant emissions and acid precipitation effects. Because theories regarding the phenomena of acid precipitation and long-range transport are largely speculative, there is no indicator that can presently be used for significant effects. The discussion of acid

Table 3-1. APPLICABLE NEW MEXICO AND NATIONAL AMBIENT AIR QUALITY STANDARDS AND CLASS I AND II PREVENTION OF SIGNIFICANT DETERIORATION INCREMENTS

Pollutant	Averaging Time	New Mexico Standards[a]	National Standards[b]	PSD Increments[b] Class I	PSD Increments[b] Class II
Sulfur dioxide	Annual average	0.02 ppm	80 $\mu g/m^3$	2 $\mu g/m^3$	20 $\mu g/m^3$
	24 hours	0.10 ppm	365 $\mu g/m^3$	5 $\mu g/m^3$	91 $\mu g/m^3$
	3 hours	-	1300 $\mu g/m^3$	25 $\mu g/m^3$	512 $\mu g/m^3$
Suspended particulate matter	Annual geometric mean	60 $\mu g/m^3$	75 $\mu g/m^3$	5 $\mu g/m^3$	19 $\mu g/m^3$
	24 hours	150 $\mu g/m^3$	150 $\mu g/m^3$	10 $\mu g/m^3$	37 $\mu g/m^3$
Nitrogen dioxide	Annual average	0.05 ppm	100 $\mu g/m^3$	-	-
	24 hours	0.10 ppm	-	-	-
Carbon monoxide	8 hours	8.7 ppm	10 mg/m^3	-	-
	1 hour	13.1 ppm	40 mg/m^3	-	-

[a]Except for particulate matter, the New Mexico standards are defined in units of volume (parts per million, or ppm).

[b]Federal Standards and PSD increments are defined in units of micrograms per cubic meter ($\mu g/m^3$).

precipitation impacts is therefore limited to potential effects, based on current research.

Visibility

In the EPA's visibility regulations (December 2, 1980), determinations of adverse impact are assessed with respect to anticipated frequency of occurrence of an "impairment" to visibility associated with a new or modified source of air pollution. Also considered in this determination are the time that such impairments are expected to occur and the intensity, duration, and extent of impairment. No further guidance is provided relating quantitative qualities of color, contrast, and visual range with adverse impact determinations.

For the NMGS analysis, the significance of visibility impacts was based on the intensity of visible plume occurrences, frequency of occurrence, and the time of such occurrences. The latter two items were assessed using the number of mornings and afternoons with projected visibility impairment within a given year. Such tabulations were broken down by season.

Intensity was assessed with respect to the plume perceptibility factor, ΔE, that is computed by the visibility model. Levels of ΔE that are greater than 4 are considered to be an indicator of significant impact. Such levels are tabulated with respect to frequency and time of occurrence. Also tabulated are ΔE levels of 5 and 10. A ΔE level of 5 represents a plume that is slightly more perceptible than one with a ΔE level of 4. A ΔE level of 10 is judged to represent a highly visible plume.

Radionuclides

The increases in concentrations of the various radioactive substances that could potentially be released during combustion of coal were compared with the NMEID standards. If the concentration would be above the standard as a result of NMGS, this would be considered a significant impact.

CONSTRUCTION

No significant impacts would result from fugitive dust or gaseous pollutants resulting from construction of the NMGS (Air Quality Technical Report).

Operation, Maintenance, Abandonment

Maximum concentration increases of pollutants due to NMGS were computed to occur in the general vicinity (within 12 miles) of the project site and are shown in Table 3-2. Concentration increases due to NMGS would be below the EPA-specified levels used to determine the geographic area of influence at distances of approximately 47 miles in the southwest and westerly directions, and at distances of 30 to 38 miles in other directions. They would occur within the San Juan Air Basin. Concentration increases due to NMGS in the San Juan River valley as well as the Class I areas of Mesa Verde and San Pedro Parks would be below the EPA-specified levels. They would also be below the Class I increment limits contained in EPA's PSD regulations.

The maximum concentration increases, when combined with Baseline 1 and Baseline 2 levels, result in total predicted concentrations that are less than the applicable New Mexico and federal ambient air quality standards. The combined concentrations as well as the concentration increases from NMGS alone are presented in Tables 3-2 and 3-3, which present comparisons with the New Mexico and federal ambient air quality standards, respectively.

Maximum combined concentrations would occur at locations to the north of the project site. Maximum concentration increases due to NMGS alone are expected to occur generally in the southeast direction from the project site.

Stagnation Episodes

Stagnation episodes are defined as the persistence of low wind speed conditions for extended periods of time. The project region does not usually experience stagnation episodes of long duration, as evidenced by the three-year meteorological data base collected by PNM at the project monitor site.

The effect of air pollutant emissions from NMGS during stagnation episodes was simulated using dispersion modeling. Because these episodes would not be expected to persist for periods of longer than a few hours, compliance with the 3-hour

Table 3-2. MAXIMUM COMBINED IMPACT CONCENTRATIONS AND CONCENTRATION INCREASES DUE TO NMGS ALONE PROJECTED FOR PROJECT VICINITY AND COMPARISON WITH NEW MEXICO AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	New Mexico Standards	Combined Maximum Concentration[a]	Maximum Concentration Increase due to NMGS Alone
SO_2	24-hour	0.10 ppm	0.060-0.065 ppm[b]	0.029 ppm[c]
	Annual	0.02 ppm	0.007 ppm[d]	0.002 ppm[e]
NO_2	24-hour	0.10 ppm	0.060-0.071 ppm[c]	0.054 ppm[c]
	Annual	0.05 ppm	0.009 ppm[d]	0.003 ppm[e]
TSP	24-hour	150 $\mu g/m^3$	115-130 $\mu g/m^3$ [f]	13-27 $\mu g/m^3$ [g]
	Annual	60 $\mu g/m^3$	48-57 $\mu g/m^3$ [f]	3-5 $\mu g/m^3$ [g]

[a] Represents the modeled emissions of San Juan and Four Corners power plants, with NMGS, added to a range of "non-power plant" baseline concentrations. This is explained in further detail in the Air Quality Technical Report.

[b] Located approximately 10 miles north of NMGS.

[c] Located approximately 8 miles southeast of NMGS.

[d] Located approximately 25 miles north of NMGS.

[e] Located approximately 12 miles north-northeast of the plant site.

[f] These values represent the fugitive dust emissions resulting from the coal- and ash-handling facility combined with the hypothetical mine and added to the baseline concentration. They are predicted to occur within 3 miles of NMGS. These values were predicted to be greater than TSP due to stack emissions.

[g] Same as footnote f above, except the hypothetical mine is not included.

Table 3-3. MAXIMUM COMBINED IMPACT CONCENTRATIONS AND CONCENTRATION INCREASES DUE TO NMGS ALONE PROJECTED FOR PROJECT VICINITY AND COMPARISON WITH FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Standards ($\mu g/m^3$)	Combined Maximum Concentration[a] ($\mu g/m^3$)	Maximum Concentration Increase due to NMGS Alone ($\mu g/m^3$)
SO_2	3-hour	1300	617-659[b]	290[c]
	24-hour	365	134-147[d]	64[c]
	Annual	80	16[e]	4[f]
NO_2	Annual	100	14[e]	10[f]
TSP	24-hour	150	115-130[g]	13-27[h]
	Annual	75	48-57[g]	3-5[h]

[a] Represents the modeled emissions of San Juan and Four Corners power plants, with NMGS, added to a range of "nonpower plant" baseline concentrations. This is explained in further detail in the Air Quality Technical Report.

[b] Located approximately 9 miles east-northeast of NMGS.

[c] Located approximately 8 miles southeast of NMGS.

[d] Located approximately 10 miles north of NMGS.

[e] Located approximately 25 miles north of NMGS.

[f] Located approximately 12 miles north-northeast of the plant site.

[g] These values represent the fugitive dust emissions resulting from the coal- and ash-handling facility combined with the hypothetical mine and added to the baseline concentration. They are predicted to occur within 3 miles of NMGS. These values were predicted to be greater than TSP due to stack emissions.

[h] Same as footnote g above, except the hypothetical mine is not included.

SO_2 federal ambient air quality standard was assessed.

The model predicted a short-term concentration increase of less than 0.046 parts per million (ppm) from NMGS alone, under stable conditions and a low (2.0 meters per second) wind speed. This value is 65 percent lower than the maximum predicted from modeling using actual meteorological data for NMGS alone.

The lower concentration increase value mentioned above is attributed to the fact that under low wind speed and stable conditions, the power plant plume would rise to great heights, thus reducing ground-level concentrations. Higher wind speeds reduce plume rise and thus increase ground-level concentrations.

Acid Precipitation

No quantitative techniques are currently available with which to project acid precipitation formation and effects due to a particular source. However, if increases in acid precipitation as the result of NMGS do occur, the alkaline nature of soil in the San Juan Basin and the presence of soil in local waterways should serve as a buffer and minimize any impacts to wildlife, vegetation, or aquatic resources in the San Juan Basin. Based on the available literature, the potential for an impact associated with acid precipitation exists for high mountain lakes in northern New Mexico and in Colorado (Air Quality Technical Report). Impacts may result in these lakes because they are poorly buffered, making them susceptible to reductions in pH caused by acid precipitation that could affect sensitive biota. Assuming that there is potential for acid precipitation effects in these high mountain lakes and that it is related to SO_2 and NO_x levels, then NMGS could potentially have an impact by contributing along with the cumulative emissions from other sources in the region, plus other sources as far away as the West Coast. Based on the total emissions projected for a three-state area (New Mexico, Utah, and Colorado), NMGS would contribute approximately 3 percent of this total.

Under NEPA requirements, in cases where scientific evidence is lacking or is subject to widespread scientific debate, an impact assessment must be based on worst-case assumptions. Thus, under worst-case assumptions, there would be a potential for NMGS to contribute to an adverse impact in high mountain lakes.

Visibility

Although not quantifiable, NMGS would contribute to the regional haze now visible from Chaco Culture National Historical Park. Furthermore, the results of visibility analyses indicate that the plume from NMGS could be slightly visible from the San Pedro Parks Wilderness Area and Mesa Verde National Park. Because of the distance of these sites from NMGS (75 miles), neither plume perceptibility nor visibility impairment would be frequent or significant. From Chaco Culture National Historical Park, the maximum occurrence of perceptible plume discoloration (ΔE 4 level) is likely to be during the winter. Such discoloration is predicted to occur about 36-37 mornings and 5-6 afternoons per year. Highly perceptible plume discoloration (the indicator ΔE 10 level, as discussed above) is predicted to occur about 1-2 mornings per year, with maximum occurrence again indicated in the winter.

Radionuclides

Modeling of radionuclide emissions was based on the content of radioactive substances in the coal and assumed that 100 percent of these substances would be emitted upon combustion of the coal. The concentration increase of all radionuclides was predicted to be 0.0049 percent of the New Mexico Environmental Improvement Division (NMEID) standards for protection against radiation for unrestricted areas. This impact would be insignificant, based on the previously defined indicators of significance.

NOISE

Noise impacts were evaluated with respect to health impacts, activity interference, and perceptivity impacts. Health impacts are assessed with regard to the effect of noise upon human hearing. Activity interference is assessed with respect to impairment of conversation. The EPA recommends an outdoor noise level of 55 decibels as requisite to protect human hearing and prevent activity interference. This level was used as a guideline with which to compare total noise levels resulting from operation of NMGS.

Perceptivity impacts are related to how noise levels are likely to be judged (loud, soft, no difference) by the listener. Observations that have been made reveal that a change in noise level (i.e., an increase) of about 9 dB(A) represents a doubling of perceived loudness or the "noisiness" of a sound (Stevens 1972). Because of the isolated nature of the nearby Bisti and De-na-zin WSAs and the low baseline noise levels there, it was assumed that a noise increase of 9 dB(A) should be considered significant in such areas. These assumptions were based on consultation with recreation and wilderness values specialists.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Probable impacts from construction and operation of NMGS have been assessed by using data obtained in the area of the operating Four Corners and San Juan power plants. These plants are considered representative of conditions during operation of NMGS. Significant impact of plant noise was not observed beyond 0.5 mile from the plant boundaries. Monitoring at San Juan Generating Station indicated no detectable impact at distances beyond 2 miles from the plant boundary.

The Bisti and De-na-zin WSAs are located 2.1 and 3.5 miles from the boundary of the proposed NMGS, respectively. Based on the above, power plant noise has been found to decrease to existing levels at distances of approximately 2 miles. It is concluded that noise due to operation of the NMGS should be barely discernible at the WSAs. Thus, no significant impact is expected at these or locations farther than 2 miles (including Chaco Culture National Historical Park).

Noise impacts due to increased employee automobile traffic associated with NMGS were also calculated and compared with the baseline noise levels. Such noise levels are inclusive of automobile and haul truck traffic associated with the "hypothetical mine," as well as blast noise from this mine. Details of the calculations are presented in the Air Quality Technical Report.

At the Bisti WSA, noise levels are projected to increase slightly (approximately 1 dB[A]) above baseline levels there. At the De-na-zin WSA, it is not known to what degree traffic associated with the hypothetical mine would use the road adjacent to this area (Road C-15). Assuming that the baseline results in negligible traffic use of this road, a moderate increase in the amount of traffic on C-15 (i.e., 20 to 30 vehicles per hour) would be likely to result in a 9 dB(A) increase above baseline noise levels at the boundary of the WSA. In the situation in which C-15 would experience maximum use by employees associated with the hypothetical mine, approximately 700 vehicles per hour would be necessary to cause such an increase above baseline levels at the boundary. Within the WSA itself (1/4 mile from Road C-15), approximately 2000 vehicles per hour would be necessary to cause the 9 dB(A) increase above baseline noise levels.

It is not likely that such large traffic volumes would occur on C-15 as a result of NMGS. However, the former situation, which assumes a low level of traffic on C-15 in the baseline, presents a potential for significant impact at this WSA (see Wilderness section).

GEOLOGIC SETTING

Indicators of significance were identified as follows:

- Disturbance to or destruction of a geologic feature not found elsewhere in the San Juan Basin or a geologic feature of unusual scientific value for study and interpretation
- Geologic conditions potentially damaging to project components

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

No impacts to unique geologic features or locations of unusual scientific value were identified. The potential for geologic hazards to project components that should be considered in the foundation or structural design and construction of components is detailed in Table 3-4. Where high potential for geologic hazards exists, structural failure of project components could result in significant impacts to health and safety.

MINERAL RESOURCES

Indicators of significance were identified as follows:

Table 3-4. PROJECT COMPONENTS EXPOSED TO POTENTIAL GEOLOGIC HAZARDS

	Project Component											
Potential Hazard	NMGS	P1[a]	P2[a]	P3[a]	R1	R2	T1	T2	T3	T4	T5	Rio Puerco Substation
Landslides				High			High			High		
Spontaneous combustion	Low	Low	Low	Low			Low	Low	Low	High	Low	
Soluble soils	Low				Low	Low						
Expansive soils	High				Low	Low						Low
Collapsing soils	Low				Low	Low						
Accelerated erosion	Low	Low	Low	High								
Piping	Low				Low	Low				Low		
Mine subsidence										Low		
Seismic shaking	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High
Seismically induced ground failure		Low	Low	Low						Low		
Surface fault rupture							Low	Low	Low	Low		Low

Note: "Low" indicates some potential may exist; "high" indicates that a relatively high potential appears to exist.

[a]Including intake pumping plant and booster pumping stations.

- Preemption of extraction of mineral resources underlying project features and either exceeding value of project feature or not readily available elsewhere
- Consumptive use of 1 percent or more of the available mineral resources in the geographic area of influence

CONSTRUCTION

Construction of NMGS would result in the consumptive use of 225,000 cubic yards of sand and gravel. No significant impacts would result.

OPERATION, MAINTENANCE, AND ABANDONMENT

Operation of NMGS would result in consumptive use of 300 million tons of coal and 4 million tons of limestone over the 40-year life of the project. Use of this amount of limestone would not constitute a significant impact. Consumption of 300 million tons of coal would be considered a significant impact on a local and regional level. More than 1 percent of the estimated strippable coal reserves in the Bisti area (local) and within a 30-mile radius of the NMGS plant site (regional) would be consumed. From a national perspective, this coal consumption would not constitute a significant impact.

PALEONTOLOGICAL RESOURCES

In this study, a fossil was considered significant if it fulfilled any of the following criteria:

- It provides important information on the evolutionary trends in organisms, relating living inhabitants of the earth to extinct organisms or clarifying relationships among extinct organisms.
- It provides important information regarding development of biological communities, or interaction between botanical and zoological biotas.
- It demonstrates unusual or spectacular circumstances in the history of life.
- It is in short supply and in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and is not found in other geographic locations.

A fossil was not considered significant if:

- It is a species that occurs in large numbers throughout a large geographic area.
- It does not provide additional scientific data not found in other specimens of the same species.
- It does not fulfill any of the significance requirements listed above.

In order to determine the magnitude of anticipated impacts to significant fossils, the study area was classified into zones reflecting the relative sensitivities of paleontological resources to disturbance by the proposed development. It is important to note that this classification takes into account the specific type of development proposed for each part of the study area and not merely the abundance and significance of fossils in a given geographic area.

The vast majority of fossils would be located in bedrock; so an area that contains rich and important paleontological resources is given a relatively low sensitivity classification if the specific type of development proposed for that area entails little or no appreciable disturbance of bedrock.

The classification consists of three zones or categories of sensitivity: high, moderate, and low.

- <u>High Sensitivity</u>: Regions where abundant significant fossil assemblages or individual fossils have been recovered; where high potential exists for natural erosion to expose more significant material; or where the proposed development is likely to cause direct disturbance to material exposed at the surface or interfere with the future recovery of potentially significant fossils.
- <u>Moderate Sensitivity</u>: Regions where significant fossils are known to occur in low abundance; where a realistic probability exists for natural erosion to expose more significant material but in low abundance; or where development is likely to result in limited direct disturbances to material exposed at the surface or interfere with future recovery of significant fossils.

- Low Sensitivity: Regions where no fossils or only insignificant fossils are known to occur, where there does not appear to be a realistic probability that natural erosion will expose new material, or where the scheduled development will result in no appreciable disturbance to bedrock.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Areas of significant paleontological resources could be adversely affected by the construction and operation of the proposed project, either directly by the destruction, damage, or alteration of bedrock formations or indirectly by the increased recreational fossil collecting or commercial collection of materials. The proposed plant facility is in an area of high paleontological sensitivity (Map 3-1).

SOILS, PRIME AND UNIQUE FARMLAND

SOILS

Indicators of impact significance included the degree and areal extent of disturbances, erosion susceptibility, and reclamation potential of the areas that would be directly affected during construction, operation, and maintenance of the various project components. Impacts to the soils resource were considered significant if there is a high probability that soil erosion would not be limited to acceptable levels and disturbed areas would not be able to revegetate. ("Acceptable level" is defined as the amount of soil loss that would not significantly affect the long-term productivity and stability of disturbed areas.) Findings were based on analysis of soils and terrain traversed, and mitigation and reclamation measures contained in the project description.

Construction/Operation, Maintenance, and Abandonment

Construction of the NMGS would disturb approximately 2400 acres of soils and topography. Soil surface disturbance, excavation, and removal of vegetation would increase the present soil erosion rates and soil instability in those areas not covered by facilities or surfaced. These increases would continue until vegetation becomes reestablished on the disturbed areas. Table 2-5 summarizes potential soil reclamation problem areas for the NMGS. In the absence of successful reclamation, potentially significant impacts to the soils resource would occur in areas of steep terrain or high wind or water erosion susceptibility.

PRIME AND UNIQUE FARMLAND

Impacts were considered significant if any prime or unique farmlands were to be taken out of production by surface facilities associated with the Proposed Action or alternatives.

Construction/Operation, Maintenance, and Abandonment

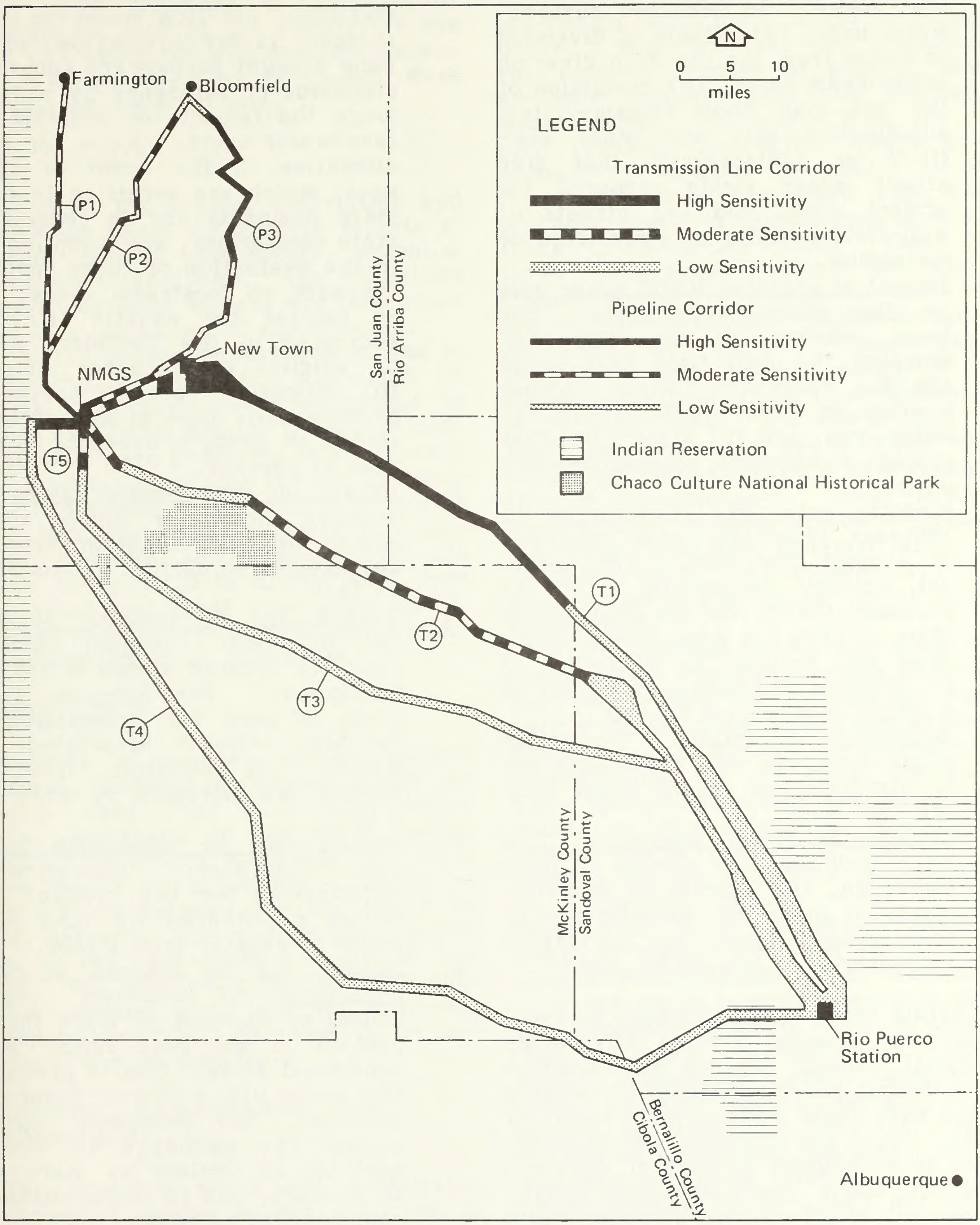
Since the surface facilities associated with the Proposed Action and alternatives would not be located on prime or unique farmlands, no impacts to them would result from project implementation.

HYDROLOGY

The principal hydrologic issues that have been addressed in this impact assessment are those most likely to be affected by the proposed NMGS. These issues were selected during the scoping process on the basis of: (1) the description of the Proposed Action and alternatives, and (2) generalized knowledge of hydrologic conditions in the potentially affected geographic region. From initial analysis of the project description and hydrologic conditions, it became apparent that some aspects of the hydrologic environment would be more likely than others to be affected by the proposed NMGS, or that some could be affected much more seriously than others. On this basis, subsequent collection and analysis of data focused on issues that would be most relevant to the assessment of potential hydrologic impacts related to NMGS and to other actions proposed to occur contemporaneously and in the same approximate geographic region.

The principal hydrologic issues that have been addressed are:

1. <u>Impact of proposed NMGS water uses on other surface-water users</u>. This issue includes: (a) the availability



Source: BLM 1982.

Map 3-1. RELATIVE PALEONTOLOGICAL SENSITIVITIES WITHIN THE STUDY AREA

of water from Navajo Reservoir and the Upper Colorado River Basin for uses in New Mexico, (b) provisions of interstate compacts and treaties that pertain to proposed surface-water uses, (c) effects of diversion of water from the San Juan River on downstream users, (d) discussion of the San Juan River stream-system adjudication suit and other conflicts or controversies that may affect water rights proposed for project uses, and (e) effects of well-field pumping on streamflow or springflow.

2. Impact of proposed NMGS water uses on other ground-water users. This issue includes (a) the effects of pumping the well field that would tap the Westwater Canyon Member aquifer on other wells within the study area, and (b) effects of other project components on ground-water users.
3. Flooding potential. Comparison of 100-year floodplain with locations of project facilities. For "critical actions" associated with the proposed NMGS, the 500-year floodplain is used for comparison. This issue also includes an evaluation of an increase in flooding potential as a result of a project facility.
4. Subsidence potential. Evaluation of potential for land subsidence due to withdrawal of ground water from the well field.
5. Changes in runoff conditions. This issue includes (a) effects on peak discharge, (b) effects of impoundments or diversions associated with the proposed NMGS, and (c) effects on recharge to alluvial aquifers.

Certain threshold values were selected during the scoping process (Hydrology Technical Report) for use as indicators for assessing the significance of impacts on the hydrologic systems as a result of NMGS. One or more indicators were established to correspond to each of the principal hydrologic issues discussed above. In general, environmental impacts would be considered significant if the predicted effect exceeds the value of the indicator(s) for that particular hydrologic issue.

The indicators of significance are as follows:

1. Impact on surface-water users. (a) Indicator: project causes a predictable decrease in water available to existing users. Various statistical low-flow measures (e.g., 10-year, 15-day streamflow) or historic drought periods are adopted as standards of reference by which to judge the impacts on existing surface-water users. Rules for water allocation in the event of shortages, which are specified in interstate compacts and in federal and state regulations, are complied with in the evaluation of these impacts. (Impacts on in-stream users, such as habitat for aquatic life, are addressed in the Technical Report on Wildlife and Aquatic Biology.) (b) Indicator: project causes the average daily flow of any perennial stream or spring to decrease by more than 15 percent.
2. Impact on ground-water users. Indicator: the water supply system causes the potentiometric surface in any aquifer to decline by more than 25 feet.
3. Impact due to flooding potential (a) Indicator: project facilities that are located within a 100-year floodplain. The 500-year floodplain is used for comparison for "critical actions" associated with NMGS. (b) Indicator: flood elevations are increased by more than 1 foot.
4. Impact due to subsidence potential. Indicator: ground-water withdrawal for the project that causes a potential for land subsidence of greater than 1 foot.
5. Impact due to changes in runoff conditions (a) Indicator: project causes an increase of more than 15 percent in the peak runoff in an ephemeral stream from a precipitation event with a 10-year recurrence interval. (b) Indicator: project causes the recharge to alluvial aquifers to decline by more than 15 percent, due to impoundment of ephemeral streamflow.

OPERATION, MAINTENANCE, AND ABANDONMENT

Changes in runoff conditions in De-na-zin Wash due to the water storage

reservoir, storm water retention ponds, and an increase in impervious area resulting from the plant facilities would be relatively minor because of the relatively small tributary contribution of the drainage area in the vicinity of the NMGS site compared with the 184-square-mile drainage area of De-na-zin Wash upstream of the plant site.

WATER QUALITY

Based on the project description and information about the generic effects of different project components, potential effects were identified. The magnitude of these potential effects was then compared with indicators of significance.

A water quality impact was judged to be significant when the standards or criteria that have been designated to protect beneficial uses of the water body in question were predicted to be exceeded. Specific standards include the surface- and ground-water quality standards of the New Mexico Water Quality Commission. Specific water quality criteria include those listed in EPA's "Blue" book (NAS 1973) and "Red" book (EPA 1976), and the recently promulgated water quality criteria for toxic pollutants.

CONSTRUCTION

Because of planned erosion control measures, detailed in Chapter 1, and the already very high suspended solids levels, increases in suspended solids levels in De-na-zin Wash and its tributaries would be negligible. Spills of construction-related liquids (such as fuels, solvents, and oils) would degrade soils in the immediate vicinity of the spill. The previously discussed erosion control measures would limit the movement of contaminated soil particles to De-na-zin Wash and its tributaries.

OPERATION, MAINTENANCE, AND ABANDONMENT

The proposed water and wastewater management system is not expected to discharge any liquids into area streams under normal operating conditions. Available information indicates that similar designs have resulted in successful zero-discharge systems. However, discharges of coal-pile runoff under high rainfall conditions (the coal-pile runoff pond would be designed to contain runoff from the 10-year, 24-hour storm) and of wastewater from the plant under upset or off-design conditions could potentially occur. The relatively dry climate and the relative success of present design concepts indicate that few discharges would occur. Discharges from the coal pile (storing low-sulfur coal) would probably be similar in quality to that found in De-na-zin Wash and would probably occur in conjunction with high flows in De-na-zin Wash. These high flows would tend to dilute the concentrations of any constituents that were higher in coal-pile runoff than in De-na-zin Wash runoff. Discharges of plant wastewater during upset or off-design conditions would flow downstream in De-nazin Wash. The downstream distance the discharge would travel would depend upon the volumetric rate and duration of the discharge. Short-duration, small-volume discharges would probably infiltrate into the alluvium along the De-na-zin Wash. Longer-duration, larger-volume discharges would travel farther downstream.

While some loss from evaporation would be expected, the ultimate fate of most of the water would be the alluvial water-bearing zones in the downstream channels. Because of the conceptual nature of the present plans for the water and wastewater management system and the unplanned nature of the discharge, the specific quality characteristics of potential discharges cannot presently be predicted. It is likely, though, that the TDS content of such unplanned discharges would be higher than that found in some alluvial wells downstream of the plant.

If the liners beneath the storm runoff and evaporation ponds work as planned, loss of liquids from the ponds would be small. Monitoring systems would be designed to detect such losses and, if necessary, to signal the need for remedial actions or operational changes. Off-site leachate migration away from the solid waste disposal sites would not be expected because the limited precipitation and high evaporation rates severely limit the amount of water that could enter the disposal site. For similar reasons, water movement into the disposal site

from adjacent formations is expected to be neglible.

VEGETATION

Riparian vegetation and other types that comprise less than 1 percent of the region of comparison (a 10-mile radius around the plant site or a 20-mile-wide strip centered on ROWs) were defined as locally rare or unique vegetation types. If anticipated project impacts removed or altered 1 percent or more of a unique or rare type in the region of comparison around a proposed or alternate project component, the first indicator of significance was met. If the impact was considered adverse and long term (at least 3 years, or three growing seasons), then the impact was defined as significant. For more common vegetation types, impacts were assessed case by case, considering the particular types, their abundance, and their role in the region.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Removal of the majority of vegetation on the proposed plant site is identified as a large-magnitude impact but not a significant impact. The impact is not considered significant because of the abundance of similar vegetation types (shrubland/grassland) in the region of comparison.

WILDLIFE

Impacts to crucial wildlife habitat were analyzed for several important categories of wildlife: (1) recreationally or commercially important species (generally game species), (2) species characterized by uncertain or declining population status, (3) rare species, and (4) those species expected to be sensitive to project activities and which, as a result, may not be capable of sustaining current populations. Crucial habitat is defined as those areas important for the maintenance and perpetuation of wildlife populations. Generally these areas are characterized by population concentrations during critical periods (e.g., winter range, breeding grounds, or brooding grounds). Within these periods, populations are very susceptible to human disturbance and effects on individuals may result in the loss of several generations of progeny. Species not included in categories designated as "important" include species such as songbirds, small mammals, and insects. These species are not generally considered recreationally or commercially important and generally are capable of rapid recovery and repopulation of disturbed areas due to large population sizes, rapid turnover rates, and mobility.

In order to evaluate the significance of impacts to crucial areas due to habitat removal (residual impacts such as loss of carrying capacity) two indicators were considered:

1. Each crucial wildlife area identified through data compilation and personal communication with persons knowledgeable about the areas was analyzed to determine the relative extent of habitat disturbance that would be expected to result from the Proposed Action or alternatives. If less than 1 percent of the total available crucial habitat within the geographic area of influence is expected to be disturbed by the project activities, then the signifi cance of that impact was considered to be low. If it was determined that more than 1 percent of the total would be disturbed (see indicator 2), then analysis was conducted in further depth to identify possible significant impacts.
2. This indicator would be applied if a finding of significance was made from indicator 1 (greater than 1 percent disturbance). If the amount of disturbance was found to be greater than 1 percent, further analysis determined whether the nature of disturbance would create beneficial or adverse impacts, as well as short-term or long-term impacts, to the wildlife resources. For purposes of this determination, the following definitions were employed:

   - Short-term: The impact is expected to persist less than 5 years
   - Long-term: The impact is expected to persist more than 5 years

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Approximately 2400 acres of nongame wildlife habitat would be removed at the proposed NMGS site. No significant impacts were identified as the result of this habitat removal.

Greater hunting and fishing pressure would occur as the result of increased populations associated with the construction and operation of NMGS. Based on state of New Mexico population projections (Recreation Technical Report), estimates of increased fishing pressure indicate that an average of 15,500 additional fish would be harvested per year through the year 2000; projections for increased hunting pressure indicate that an average of 45 additional mule deer would be harvested per year through the year 2000. (This represents an approximate 2 percent increase in harvest over baseline conditions.) It is not possible to predict the area in which increased hunting and fishing would occur because desirable hunting and fishing areas are found throughout the geographic region. However, it is likely that areas that have historically supported the most hunting and fishing pressure would sustain the largest increases in harvest.

Human-related disturbances in the geographic area of influence would result in increased intentional and unintentional harassment of wildlife. Impacts would result from such activities as off-road vehicle activity, target shooting, camping, poaching, and general increases in human presence. Although impacts cannot be quantified, they would include increased road kills, displacement of animals to other habitats, and occasional interference with reproductive success.

No raptor nesting sites would be removed by project construction activities, and the percentage loss of hunting territories would be small compared with habitat that would be left undisturbed. Construction of project components during periods of raptor nesting and rearing of young would result in various human-related disturbances to nesting raptors that are located in the area of geographic influence. The potential for such impacts as abandonment of nesting sites or abandonment of young in the nest would depend on specific nest locations relative to construction activities, but could constitute significant impacts.

No significant impacts to special status species (New Mexico or Colorado state-protected or species of concern to the BLM) were identified.

THREATENED AND ENDANGERED SPECIES

Determination of impacts to threatened or endangered species was based on an assessment of project components that could potentially affect proposed listed species. Findings of "may affect" were made if a species or potential habitat has been reported in the geographic area of influence (3.75 square miles at the plant site) and if there is potential for direct or indirect impacts to individuals, populations, or critical habitat. A finding of "no effect" was made if the species or potential habitat has not been reported in the geographic area of influence or there is little potential for direct or indirect impacts.

CONSTRUCTION

No threatened or endangered species would be affected because the species of concern do not occur in areas that would be disturbed by construction activities.

OPERATION, MAINTENANCE, AND ABANDONMENT

The only impacts identified to threatened or endangered species that could result from operation and maintenance of the proposed NMGS are impacts associated with the potential for acid precipitation under worst-case analysis. The general potential for these impacts is discussed in the Air Quality section. Additional analysis and the consequences of acid precipitation are discussed for each species in the Threatened and Endangered Species Technical Report. With the exception of the greenback cutthroat trout, no impacts resulting from acid precipitation were identified for any threatened or endangered wildlife or aquatic species. A summary of the findings from the Threatened and Endangered Species Technical Report is presented below.

The headwater streams in high mountain areas of southern Colorado that support the greenback cutthroat trout may be susceptible to increases in acidity from

potential acid precipitation. These streams lack the buffering capacity of lower-elevation streams because they usually lie in unreactive sandstone or granitic bedrock which are incapable of neutralizing the acidity of precipitation and have little buffering capacity. In addition, greater rates of precipitation that occur at higher elevations would result in relatively high rates of total acid deposition compared with lower elevations. If these high mountain, headwater streams receive acid precipitation and the waters become acidic, the greenback cutthroat trout may be affected. Acidic water has the potential to cause sublethal effects, such as inhibition of larval development, or to cause direct mortality. The probability of occurrence of these impacts and the potential magnitude of such impacts cannot be quantified.

With the exception of the Mancos milkvetch, no impacts resulting from acid precipitation were identified for any plant species. Two factors limit the potential for impacts to the species: (1) Each of the plant species assessed occurs at relatively low elevations (5000 8000 feet) where mean annual rainfall and frequency of precipitation are low; as a result, exposure to acid precipitation, either directly (on leaf and stem tissue) or indirectly (via the root system), would also be infrequent. (2) All of the plants considered in the assessment, except for Mancos milkvetch, are reported from soils that are slightly basic and well buffered, and therefore capable of neutralizing atmospheric acidity carried down by precipitation. Several of the species assessed are generally associated with saline and calcareous Mancos Shale. (Refer to the Threatened and Endangered Species Technical Report for a species-specific discussion of the buffering capability and sensitivity of soils to acid precipitation.)

Mancos milkvetch occurs on noncalcareous sands that may not provide substantial buffering capacity. Since there is no clear evidence that potential acid precipitation would be neutralized by soil carbonates, a determination of "may affect" is identified in the Threatened and Endangered Species Technical Report.

CULTURAL RESOURCES

An overview of the cultural resources of the proposed project area has been completed, addressing prehistoric and historic archaeological sites, historic properties, and sites of significance to traditional Native American religious values and practices (Cultural Resources Technical Report). In addition, an inventory of identified cultural resources within the study area, including the plant site and 2-mile-wide study areas centered on the proposed water supply and transmission system components, has been compiled and evaluated. This inventory of previously identified cultural resource sites was used for an evaluation of anticipated impacts and also provided a basis for judging the likelihood of the presence of other presently unidentified sites in the proposed project area and their sensitivity to impacts.

The indicators of significance used in the analysis of cultural resources have been adapted from federal regulations (36 CFR 60.6) that set forth minimal criteria for determining whether or not a cultural resource is "significant"--that is, is important enough to merit management consideration by projects that affect it. These criteria include:

- Sites associated with significant historic events
- Sites associated with significant historic people
- Sites that embody distinctive architectural or artistic features
- Sites that "have yielded, or may be likely to yield, information important in prehistory or history"

Most of the prehistoric and historic resources that might be affected by the proposed NMGS development are already determined to be eligible for, or are potentially eligible for, the National Register of Historic Places because of their likelihood of yielding important scientific information. However, within the body of sites that meet this minimal criterion, there is a wide range of the kinds and type of such information held in those sites and of the importance of those included data.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

The proposed construction and operation activities would directly alter, damage, or destroy an unknown number of presently unidentified subsurface sites, as well as the 40 presently identified archaeological and historic sites or sites of importance to traditional Native American values. Alteration, damage, or destruction of some of these resources could result in:

- Loss of scientific and cultural information and artifacts
- Loss of the physical expression of the resource, and visual/auditory impairment of the associated traditional cultural experiences or culture-historical values

In addition to direct impacts, significant indirect adverse impacts could occur as a result of the construction and maintenance of the proposed project. These indirect effects include:

- Increased exposure of archaeological sites (as from construction and maintenance activities, or increase in recreational use of off-road vehicles in the basin), resulting from loss of vegetation cover and increased erosion
- Increased uncontrolled collection of the archaeological resources and Native American materials (e.g., shrine offerings) by nonprofessional hobbyists, as recreational activity
- Increased commercial looting of archaeological resources
- Decreased opportunities to maintain a traditional Native American lifestyle and values, which require the maintenance of sacred sites

VISUAL RESOURCES

Visual resources are the physical characteristics of a landscape that determine its scenic quality and relevant value to the viewing public. These characteristics are described according to the line, form, color, and texture of the natural features in the environment (landform, vegetation, water, and soils) that make up a specific landscape. Since scenic quality is a measure of human sensory experience, the visual resources most important to this assessment are those within the "seen area" of both existing and potential areas accessible to people (roadways, rivers, trails, recreation sites, and human develoments). The focus of attention is on unusual and high-quality visual resources, such as badlands, mountainous terrain, steep slopes, natural drainages and waterways, interesting patterns of vegetation, and rock formations that play a dominant role in characterizing a particular scene in the context of the surrounding landscape.

The primary reference and method for identifying visual resources and significant impacts for this assessment was the BLM's Visual Resource Management (VRM) system (BLM 1978). The VRM system provides a standardized procedure for identifying, evaluating, and classifying visual resources for land management purposes.

The VRM system uses three primary factors in determining the compatibility of proposed developments with the existing natural landscape:

- The inherent scenic quality of the landscape features (visual resources) being viewed
- The sensitivity of the visual resources according to public exposure and public concern
- The viewing distance of the resources from areas of human use and viewing points

Once inventoried for these three factors, each BLM planning area is divided into subunits that can be uniformly characterized and assigned a visual management classification. There are five VRM classification designations (Table 3-5), ranging from highly valued, pristine landscapes to areas where human modification has so disturbed the natural setting that they need rehabilitation.

Because a portion of the project (alternative transmission line T4) is on lands managed by the Forest Service, the second primary reference for this study is the Visual Management System developed for Forest Service use, described in Agriculture Handbook 462 (U.S. Forest Service 1974). The Forest Service inventories its lands and classifies them

Table 3-5. VISUAL RESOURCE MANAGEMENT CLASSES FOR BUREAU OF LAND MANAGEMENT LANDS

Class I	-	This class provides primarily for natural ecological changes; however, it does not preclude very limited management activity. Any contrast created within the characteristic environment must not attract attention. It is applied to wilderness areas, some natural areas, wild portions of the wild and scenic rivers, and other similar situations where management activities are to be restricted.
Class II	-	Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. A contrast may be seen but should not attract attention.
Class III	-	Contrasts in the basic elements (form, line, color, texture) caused by a management activity may be evident and begin to attract attention in the characteristic landscape. However, the changes should remain subordinate to the existing characteristic landscape.
Class IV	-	Contrasts may attract attention and be a dominant feature of the landscape in terms of scale; however, the change should repeat the basic elements (form, line, color, texture) inherent in the characteristic landscape.
Class V	-	Change is needed or change may add acceptable visual variety to an area. This class applies to areas where the naturalistic character has been disturbed to a point where rehabilitation is needed to bring it back into character with the surrounding landscape. This class would apply to areas identified in the scenic evaluation where the quality class has been reduced because of unacceptable cultural modification. The contrast is inharmonious with the characteristic landscape. It may also be applied to areas that have the potential for enhancement, i.e., add acceptable visual variety to an area/site. It should be considered an interim or short-term classification until one of the other VRM class objectives can be reached through rehabilitation or enhancement. The desired visual resource management class should be identified.

2. Areas of Critical Environmental Concern for Scenic Values. The ACEC for scenic values are lands of high scenic value of relative scarcity. For this reason, priority identification must be made for presentation in the management framework process. Conformance with VRM Class II objectives constitutes interim management.

Source: BLM Manual 8400.

according to character types, variety class, and sensitivity level, and develops visual quality objectives (VQO) for each area. The five VQO management levels are defined in Table 3-6.

The basis of the visual impacts assessment is the project's compatibility with the VRM objectives identified by the BLM-Chaco Planning Unit Management Framework Plan (September 1981), the Chaco Planning Unit VRM evaluation, and the Forest Service VRM system evaluation for the southern portion of the study area. The assessment involved a three-phase effort: a screening process, the completion of the VRM contrast rating, and an evaluation of impact significance of specific project-related changes to landscape character.

1. Through the screening process, sensitive visual resource areas and critical viewing points were identified for detailed analyses.
2. The second phase of the assessment was to complete the standardized VRM constrast rating evaluation for the critical areas identified and for each project component within the "seen area" of the sites. In order to better understand the extent of visual contrast likely to result from various project-related consequences, two methods were used for simulating visual change: a photographic technique and a computer-generated graphic technique.
   The VRM contrast ratings are used to determine the relative change to each landscape element for each of the project components. This rating scheme allows the reviewer to identify exactly which features would result in the highest visual contrast.
3. The last phase of the visual assessment--following the screening process, contrast rating, and simulation--is the final determination of significance. The VRM system provides guidance for determining the extent of contrast. Further indicators for judging significance include the duration of the consequence, the potential for reasonable mitigation, and the sensitivity of the change in terms of public interest. For purposes of this study, visual consequences considered to be of short duration (from 2 to 5 years in areas of low to moderate sensitivity) or in areas with limited public exposure were considered insignificant. Additionally, in areas where other development (e.g., approved coal mining, gas exploration) is likely to affect the existing baseline condition in the near future, the visual consequences of the NMGS were considered in the context of overall development and landscape modification.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

The proposed plant site is located on 2400 acres of land that has a VRM Class IV rating (low sensitivity and "common" scenic quality). According to the BLM-VRM objectives, this means that modifications may be a dominant feature in terms of scale; however, the change should repeat the basic elements of form, line, color, and textural interest in the characteristic landscape. Form, lines, and color of the plant facilities would contrast with the dominant horizontal, gently rolling, open terrain that characterizes the foreground, middleground, and background of the site landscape (Figure 3-1). According to BLM guidelines, the total contrast rating for any feature in a VRM Class IV area should not exceed 20. The contrast rating compiled for the proposed plant site would be 25. Realizing that the VRM objectives are designed to provide a broad-based, standardized evaluation format that is primarily oriented to preserving natural landscape characteristics, an activity on the scale of NMGS could not do other than dominate the natural features in the setting. Since contrast objectives could not be met, the VRM class would revert to VRM V, implying a temporary classification until rehabilitation could occur. Therefore, visual impacts resulting from the construction and operation of NMGS would be significant.

The critical viewpoints of the plant would be from the highest point within the Bisti WSA (a 3-mile viewing distance) (Figure 3-2) and the De-na-zin WSA (6-mile viewing distance). Natural topographic relief would mask all but the top

Table 3-6. VISUAL QUALITY OBJECTIVES FOR U.S. FOREST SERVICE LANDS

Preservation (P)
Provides for ecological changes only.

Retention (R)
In general, human activities should not be evident to the casual visitor.

Partial Retention (PR)
Human activities may be evident but must remain subordinate to the characteristic landscape.

Modification (M)
Human activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. Development should appear as a natural occurrence when viewed in the foreground or middleground.

Maximum Modification (MM)
Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

Source: U.S. Forest Service 1974.

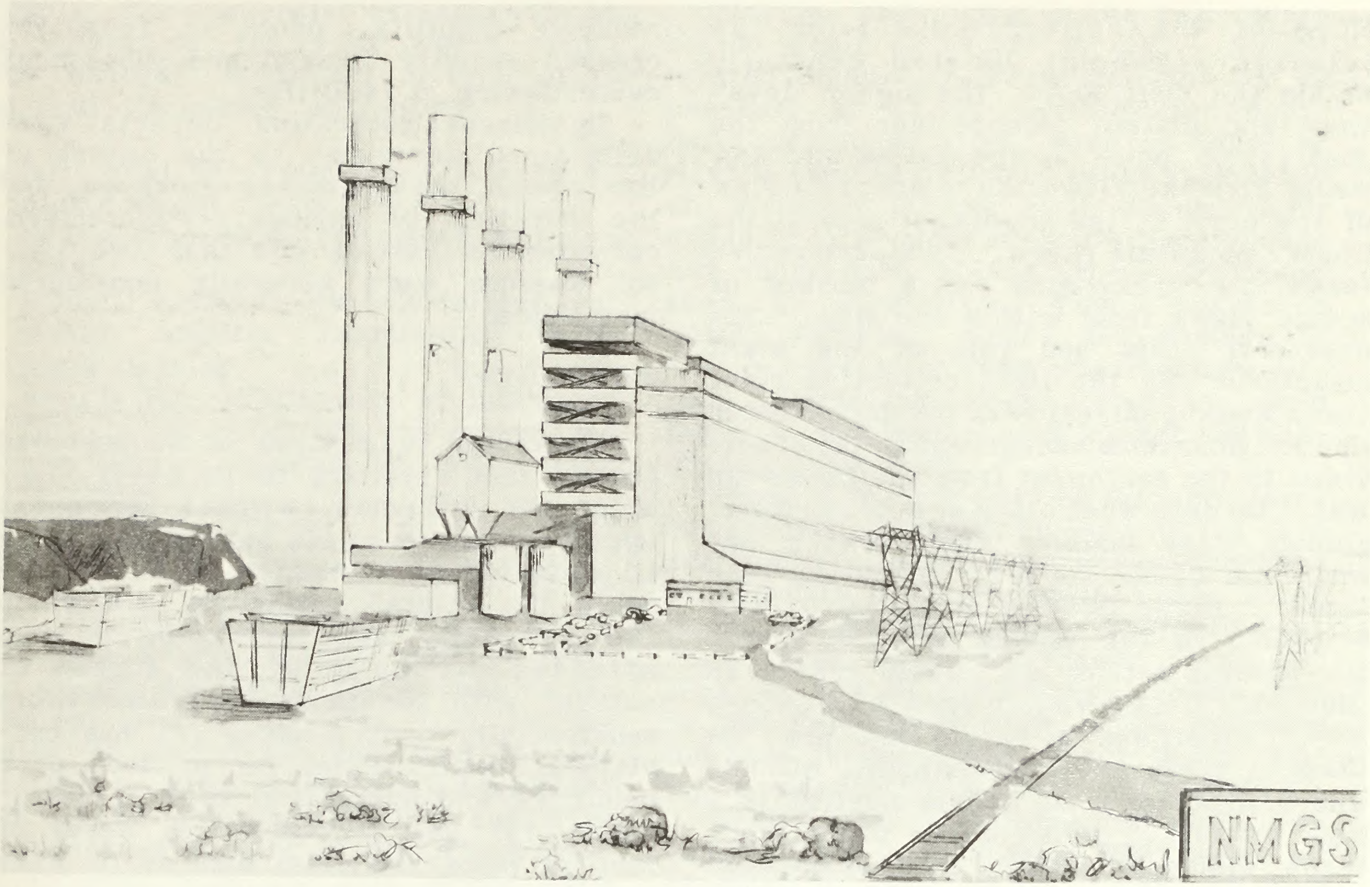


Figure 3-1. NMGS, NORTH APPROACH

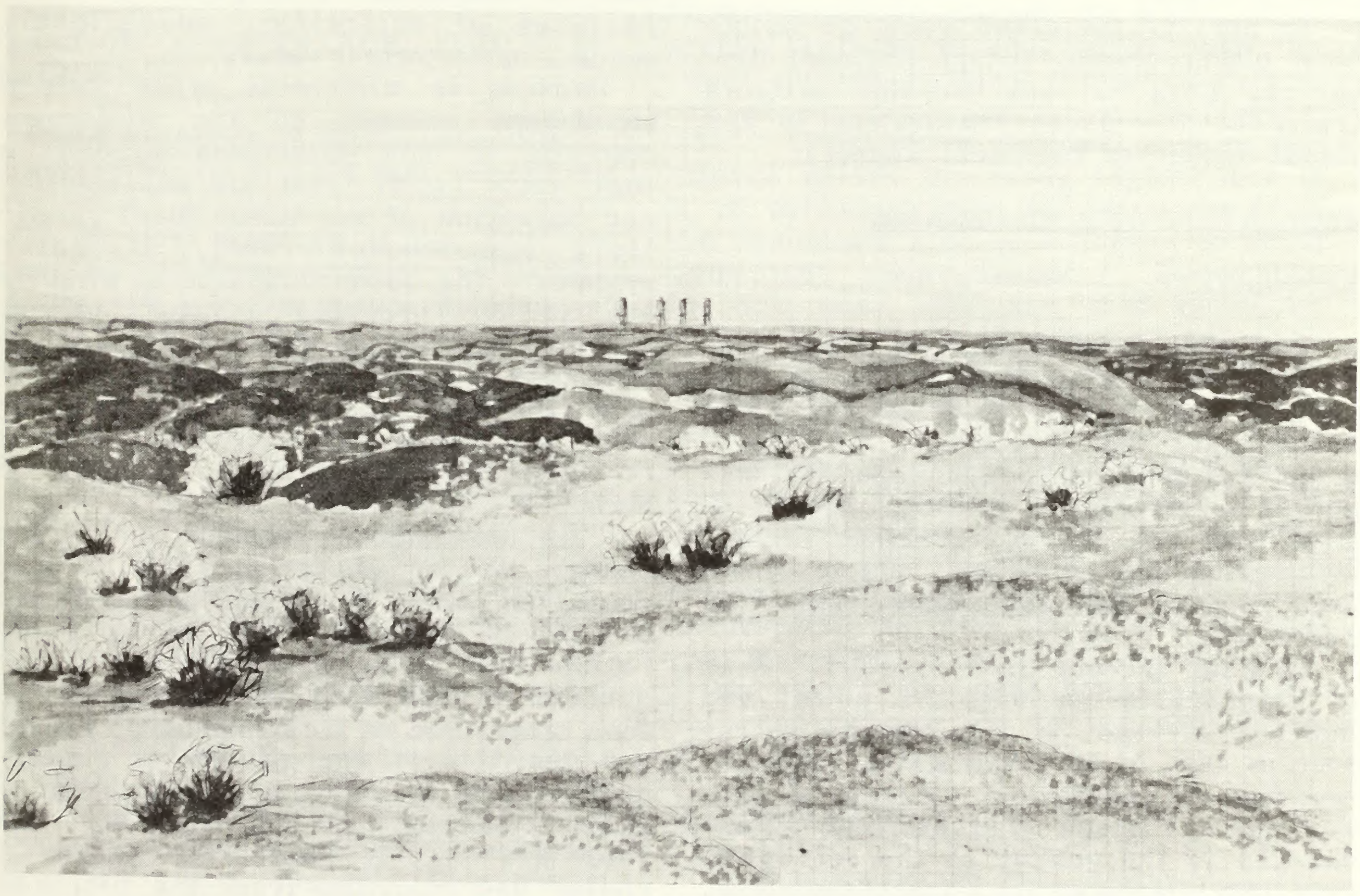


Figure 3-2. NMGS FROM BISTI WSA

third of the boiler stacks from the selected viewpoint located centrally within the Bisti WSA. The higher elevations and distant perspectives from the observation point in the De-na-zin WSA would give the viewer an almost full view of the plant to the southwest against the Chuska Mountain range. This perspective forms the background for a number of scenic views from within the WSA. The unnatural form and line of the plant structures and the light reflective color (tan) would contrast with the dark-banded Chuska Mountains background in the scenic views to the southwest from the De-na-zin WSA. On days when stack or cooling-tower plumes were visible, the viewer's eye would be drawn to the contrasting features. Night lighting would also draw attention to this human modification in the natural setting and would create an illuminated field visible from both WSAs. Both the Bisti and De-na-zin WSAs are VRM Class II areas and recommended ACECs, where protection of scenic quality is a high priority. Changes in basic landscape elements caused by management activities are not to be evident in the characteristic landscape in these VRM Class II areas.

No part of the plant would be visible from either Chaco Culture National Historical Park or any of the outliers (refer to the photo simulations in the Visual Resources Technical Report).

RECREATION AND WILDERNESS

RECREATION

Recreation resources are those formally designated areas managed to both preserve and further their use for play, amusement, and relaxation, and those areas that are used as unmanaged and dispersed recreation resources (such as sites used for fishing, hunting, hiking, sightseeing and off-road vehicle [ORV] use) within the geographic region of influence.

Critical factors in the determination of significance include the direct and indirect effects on the recreation resources (use of land and water, and disturbance to vegetation, habitat, or outstanding landscape characteristics); and changes to the quality of the recreation experience (such as from increased noise, reduced visibility, odor, or from increased activity demand and subsequent overcrowding of facilities).

Significant recreation impacts were determined according to the nature of the impact, the magnitude of change, and the duration of change. Short-term consequences lasting less than two visitor seasons were generally considered insignificant.

WILDERNESS

Wilderness is an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least 5000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition, and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Impacts to wilderness areas include significant changes to the wilderness resource or the wilderness experience that would result from the construction and operation of the NMGS plant facilities, transmission lines, or water system. The basic indicator is whether any of the proposed project features would impair the naturalness of the WSAs; the opportunities for solitude or for primitive and unconfined recreation; or ecological, geologic, or other features of scientific, educational, scenic, or historical value.

This assessment focused on direct changes to the wilderness resource that could fall within the physical boundaries of any of the nine WSAs in the study region and on project-related consequences outside the WSA boundaries of such magnitude as to significantly affect the qualities of the wilderness experience related to naturalness and solitude. Other consequences identified for this study are directly related to changes in visitor use resulting from the proposed

project. Most potential consequences to the wilderness resources would result from changes identified within other technical disciplines, as follows:

- Air quality--visibility reduction, plume height
- Noise--increase in ambient noise level
- Visual resources--modifications of scenic quality, illumination from night lighting
- Recreation--availability of resources for similar primitive and unconfined activities reduced as population increases

CONSTRUCTION

Construction activities spanning 14 years would significantly detract from the experience of solitude that is so prevalent and is directly tied to the quality of experience reported for the Bisti WSA. Noise from heavy equipment used at the construction site and from the increased number of vehicles traveling to and from the site would draw attention to the construction activities and detract from the natural experience.

OPERATION, MAINTENANCE, AND ABANDONMENT

During operation of the proposed NMGS, the aspect of the project that would have the greatest effect on recreation would be the physical presence of the plant and support facilities (ponds, switching station, etc.). The visual contrast of these structures with the natural landscape surrounding the site would significantly detract from the perception of solitude and naturalness presently experienced.

Direct impacts to the wilderness and recreation resources would include the increased visitor use from the plant work force and associated population growth. Litter, vandalism of cultural resources, fire, and removal of paleontological material could all significantly degrade the quality of the resource.

The participation in camping, picnicking, and hiking as a result of the NMGS project would place additional demands on the already stressed recreation resource base in the project region. With NMGS, the total participation days in camping, picnicking, and hiking in the two-county region would be 54,669 in 1992. NMGS-related population would account for 20 percent, or 10,208 participation days. Some developed sites, such as those at Navajo Lake State Park, could experience an increase in use well beyond their capacity to provide adequate maintenance and supervision of facilities. Problems such as vandalism, fire, increased litter, fighting, noise, and damage to fragile vegetation from unauthorized off-road vehicle use often accompany rapid influxes of visitors who cannot be adequately supervised.

Because the majority of the work force is expected to reside in Farmington area communities, most of the impacts could be expected to occur at Navajo Lake, which is currently experiencing overcrowding. Angel Peak, a BLM-managed recreation area, is one of the closest campgrounds to the Farmington area. The expected increase in use could affect BLM's ability to effectively manage this resource.

Chaco Culture National Historical Park and the Bisti and De-nazin WSAs would all experience increased use because of their accessibility to the NMGS-related increases in population. The Bisti Badlands represents one of the most unique scenic features in the region, and the Chaco Culture National Historical Park is one of the most popular archaeological sites. (Mesa Verde National Park is also located within the study region, but it is of sufficient size and distance from the immediate area of influence to avoid significant consequences.) Projections for the year 2000 are that recorded visitor days to archaeological sites on public park lands within the BLM-Chaco Planning Unit will increase from 10,000 per year to 17,000 per year. Total visitor days projected for the BLM planning unit by the year 2000 include 40,872 for sight-seeing and 97,581 for photography. Significant consequences of increased visitor use are similar to those discussed for camping and picnicking, and include vandalism to cultural resources, litter, theft of paleontological material, and degradation to the experience of solitude.

TRANSPORTATION

The objective of the analysis was to assess the adequacy of the existing and

planned infrastructure of the air, rail, and roadway network to (1) meet the projected demands resulting from the proposed action and alternatives and (2) incur temporary disruptions during the construction period. The movement of both supplies and work force to the construction sites and to the operating plant are considered in this assessment.

Rail service in the San Juan Basin is limited to the Santa Fe Railroad along the southern portion of the region. The planned Star Lake-Bisti Railroad would connect the Santa Fe line with the proposed and existing (Lee Ranch) coal mining areas. Since coal for NMGS would come from the neighboring Bisti mine along private haul roads, the focus of this assessment is on the movement of goods and personnel by road.

1. Traffic flow delays in excess of those experienced over the past 5 years on roadways used for movement of construction equipment or personnel (on urban streets, in excess of 900 vehicles per hour)
2. An increase in traffic accidents in excess of those reported for roadways used for movement of construction equipment or personnel over the past 5 years
3. Use of roadways already deficient in safety, surface foundation, or capacity

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

Although several alternatives and combinations of alternatives are being considered (PNM 1981b), most construction haul routes would use portions of NM 371 and U.S. 666-Navajo 5. The only alternative that for the most part excludes truck transport of materials along NM 371 assumes completion of the Star Lake-Bisti or Con Paso railroad spur project. The railroad spur would provide rail access directly to, or very near, the site of the NMGS. This spur would reduce to a negligible level hauling of equipment and materials to the site by truck along NM 371 or U.S. 666. If the Star Lake-Bisti spur is not used, the continuous movement of materials along NM 371 or U.S. 666-Navajo 5 during the construction phase of the project could cause travel delays along the southern stretches from Interstate 40 and require increased maintenance along the entire route. Travel delays and safety hazards along NM 57 would be most significant during months when visitation is highest at Chaco Culture National Historical Park.

Most persons employed at the NMGS would commute south along NM 371 from Farmington, Aztec, and Bloomfield. The addition of approximately 650 vehicles per day during the peak employment years would affect the traffic flows along this two-lane roadway and could result in safety problems, particularly as commuter vehicles mix with haul trucks. Further consequences related to safety and traffic congestion could occur on NM 44 south of Farmington to Huerfano if project personnel residing in the Bloomfield area chose to commute along County Road 15 to the plant site. This section of NM 44 is already congested with commuter traffic and coal trucks. Degradation of the county road would also result from heavy use, and an increase in accident potential would accompany increased use of this narrow ungraded road. This is considered a significant impact.

Two key projects will strongly affect the adequacy of the highway system in meeting the needs of the proposed NMGS. Segments of NM 371 are presently being upgraded so that the entire length from Thoreau to Farmington will be two-lane paved roadway. A series of construction projects to finish this roadway is scheduled to be completed in 1983 (Duffy 1981). If the schedule is met, there would be direct access to the site of the NMGS along a paved two-lane roadway prior to the beginning of construction of the power plant.

A second project that could help to provide adequate roadway access to the NMGS is the extension of Navajo 5 from the Burnham Trading Post east to a junction with NM 371. Navajo 5 is a paved, two-lane route that runs east from U.S. 666 to Burnham. The proposed junction with NM 371 would be located about 10 miles north of the NMGS, providing a paved route from the railway in Gallup to within 10 miles of the site. Although the survey work is completed, no construction schedule has been proposed for this extension. Completion of these two projects would provide alternative access

routes to the site, thereby allowing any impacts on the major north-south connecting roadways to be distributed throughout the system.

Municipal Traffic Consequences

Because of current traffic congestion in Farmington (see the Transportation Technical Report), the construction and operation of the proposed NMGS would make worse an already difficult situation. Preliminary estimates show that 1000 NMGS employees could be located in northern Farmington and Aztec by 1987. To reach the NMGS site, these workers would travel along NM 371. To gain access to NM 371, vehicles represented by these 1000 employees would pass directly through, or very near to, Farmington's central business district during peak hours. The addition of 650 vehicles to crosstown traffic during certain periods of the day could cause a significant increase, from 10 to 20 percent, over baseline traffic flows on key streets in Farmington.

The present configuration of the street system in Farmington would be unable to accommodate the most optimistic projection of traffic-flow increases under baseline conditions, much less the vehicle movement associated with the NMGS. Programmed improvements to the Farmington municipal street system include two projects that might help to relieve the potentially serious traffic problems. Proposals adopted as part of the City of Farmington Major Thoroughfare Plan (1977) but not yet approved by the state include completion of a bypass route south of the central business district. This project would help to reduce congestion in the downtown area by providing a more direct route from U.S. 64 east of Farmington to U.S. 550 and La Plata Highway west of Farmington. Construction would involve extending the Old Bloomfield Highway from its western terminus across the Animas and San Juan rivers to a junction with NM 371. The bypass would continue to a second crossing of the San Juan River and a junction with U.S. 550 and La Plata Highway, a total distance of somewhat less than 4 miles. This improvement would not only facilitate the movement of traffic through Farmington but would also provide better access to NM 371 (the route to the NMGS site) from the eastern portions of San Juan County.

Aside from Farmington, the community of Bloomfield would be most affected by an increase in traffic volume. The hazardous section of NM 44 that extends from the junction with U.S. 64 (near the southern municipal limit) through town would experience further deficiencies in safety and capacity.

SOCIAL AND ECONOMIC CONDITIONS

The following indicators were used to ascertain impact significance for social and economic conditions:

- Projected annual population change in existing communities exceeding 10 percent
- Projected annual increase in employment or income exceeding 10 percent
- 10 percent increase in county or community revenues
- Inability of public sector jurisdictions to meet costs of providing necessary services and facilities to new population prior to receipt of project revenues
- Demand for community services and facilities (housing, municipal services, human services, law enforcement, fire protection, recreation) in excess of projected availability.

CONSTRUCTION/OPERATION, MAINTENANCE, AND ABANDONMENT

In general, the construction and operation of the generating station would bolster the economy of the study area and would create a slight acceleration in projected population growth rates. In addition, it would result in an increase in the demand for housing and other community facilities and services, while increasing the local tax base. The proportion of project-related jobs that Navajos would obtain would depend upon their skill levels and company preferential hiring agreements.

The following list briefly outlines the primary social and economic impacts of the Proposed Action.

Population

- Project-related in-migration would increase the study area's population and would promote the continued growth of local communities such as Farmington, Aztec, and

Bloomfield. The largest annual population increase would occur in San Juan County in 1995, when 3400 more people would be attracted to the greater Farmington area as a result of the proposed action. The largest annual population increase in the City of Farmington would also occur in 1995, when an additional 1975 people would seek housing and services in the area. This would amount to a 4.4 percent increase over the projected baseline population.

- The availability of NMGS jobs would reduce the potential out-migration of local residents who would otherwise be unemployed under Baseline 1 conditions are completed in the 1990s.

Economy and Employment

The study area's economy would be stimulated by direct and indirect employment and income, which would result in continued growth and expansion of the local economy. NMGS would add over $780 million to the region in direct and indirect income, with over $75 million in direct and indirect personal income generated in San Juan and McKinley counties in 1992 alone. Construction work force demand would exceed 1600 in peak years. During the operation period, labor requirements are projected to reach 900 jobs. Competition for labor could increase the costs of local goods and services.

It is extremely difficult to estimate Navajo direct employment impacts from NMGS. While Navajo employment has increased in the past decade, Navajo unemployment rates and income levels continue to be well below comparable U.S. statistics. Minimum rates of unemployment for the tribe during the 1970s were estimated at 30 percent and over. In 1980, the potential labor force (persons 16 years of age and over) comprised 50.4 percent (or 75,030 individuals) of the Navajo population. Of this number, an estimated 60.7 percent (or 45,521) were employed and 39.3 percent (29,509) were unemployed. In contrast, U.S. unemployment rates from 1970 through 1980 ranged from a low of 4.9 percent in 1970 to a high of 8.5 percent in 1975.

It is unknown how many jobs Navajos would be qualified for and it is unknown how many Navajos would apply for those jobs. However, the employment history of the area offers some insight. The Four Corners Power Plant, on Navajo land, had a commitment to preferential hiring of qualified Navajos. At the Four Corners Power Plant there were a large number of applicants and a large percentage of Navajo employment. In 1981, 61 percent of the work force at the Four Corners Power Plant was Navajo. At the San Juan Generating Station there was no commitment to Navajo hiring preference and relatively few applicants, and fewer Navajo jobs resulted. In 1982, 7.2 percent of the San Juan Power Plant employees were Navajo. It may be assumed, therefore, that if there were no preference given to Navajo hiring, there would be few Navajos employed. If, on the other hand, the applicant does commit to Navajo hiring preference, a large percentage of total project jobs would be held by Navajos. Indirect or secondary employment in the local economy may follow past patterns of relatively few off-Reservation jobs out of the total being held by Navajos.

Public Finances

- NMGS would have a positive overall effect on public finances in the affected region's municipalities, even though projected expenditures would exceed anticipated revenues in some years. Estimated undiscounted cumulative net surplus in municipal operating funds generated between fiscal years 1985 and 2000 (in constant 1980 dollars) would be as follows:

Farmington	$221,000
Aztec	$161,000
Bloomfield	$132,000

Estimated effects on all San Juan County operating funds between 1985 and 2000 (in constant 1980 dollars) would be as follows:

1985	($2,000)
1990	$427,000
1995	$2,060,000
2000	$3,040,000

- The generating station would increase the assessed valuation of affected

taxing jurisdictions, thereby generating increased property tax revenues (or decreased tax rates).

- The Farmington Municipal School District would be positively affected by NMGS because the proposed site would be located within this district. In the Aztec, Bloomfield, and Central Consolidated school districts, increased enrollments would necessitate additional expenditures, which would not be fully met by project-related revenues.

Housing

In-migrating NMGS workers would seek housing and other services in the greater Farmington area. The total project-related housing demand associated with these workers and their families is estimated to peak at 1190 units (above baseline projections) in 1995. While there is an abundance of land zoned for residential use in the affected communities, there would be no assurance that housing units would be in place when needed by NMGS workers. Several factors could adversely affect future housing availability:

- Projected housing demand in 1986-87 exceeds the historical housing construction rate in the Farmington area. (In that year, housing demand with NMGS would rise to 1270, as compared to increased demand for 670 units that year without NMGS.)
- Mortgage interest rates are currently very high, and many potential homeowners cannot obtain affordable financing. The future of homeowner financing is uncertain.
- Vacancy rates in the affected region are currently low (estimated to be 3 percent).

Project-related demand could exacerbate a projected shortage of single- and multiple-family housing units, which in turn could increase the cost of housing, as well as the number and proportion of mobile homes in the area. This is considered a significant impact.

Municipal Services

- Project-related in-migrants to Farmington, Aztec, and Bloomfield would only marginally increase each city's projected demand for water; nonetheless, this would contribute to each city's need to acquire additional water rights.
- Project-related demands on community wastewater systems would not exceed projected capacities. NMGS would, however, cause the Farmington wastewater treatment plant to reach capacity 1 year earlier than it would otherwise.

Education

- The in-migration of project-related children would result in a small increase in the demand for teachers in each of the school districts; however, only in the Farmington School District would NMGS aggravate a facility shortage.

Human Services

- At present, most human service agencies in northern San Juan County are operating at or near capacity, and future funding sources are uncertain. Under these circumstances, increased demand for these services associated with NMGS would result in further strain on these services and a potential decrease in their quality. This is considered a significant impact.

Traditional Values and Lifestyles

- Project-related in-migration would continue to increase the proportion of non-Native Americans in the regional population, which could result in an acceleration of culture change pressures for Navajos. The cumulative effect of ongoing developments in the Eastern Navajo Agency and inmigration of non-Native Americans would result in the reduction of some opportunities for Navajos to adhere to traditional values and to pursue lifestyles based on livestock grazing. On the other hand, the availability of construction and operation jobs to Navajos would increase their opportunities to support relatives who maintain more traditional lifestyles, and to visit "home" more often because they would not have to move far away to obtain wage work. The key factor in determining whether project impacts would be perceived as adverse or beneficial by Navajos is

the extent to which they would be employed directly or indirectly as a result of the project (refer to comments under " Economy and Employment"). An additional factor would be the extent to which sacred areas are actually disturbed as a result of project-related population increases.

WATER SUPPLY SYSTEM

PROPOSED ACTION (35,000 Ac-Ft/Yr From the Navajo Reservoir [San Juan River])

HYDROLOGY

Operation, Maintenance, Abandonment

Use of the proposed water supply from the Navajo Reservoir would deplete the average annual supply of water in the San Juan River system in New Mexico by 35,000 acre-feet per year. Diversion of this supply at the proposed intake structure (Farmington) or alternative intake structure (Bloomfield) would reduce the streamflow in the San Juan River downstream of the point of diversion by 48 cubic feet per second (cfs) on an average basis. Reductions in streamflow at the proposed and alternative intake sites would not be significant, according to the indicator of significance (less than 15 percent of average streamflow during critical dry period). During drought conditions, this 48 cfs would be released from the Navajo Reservoir specifically for NMGS. Therefore an additional 48 cfs would be in the San Juan River upstream of the intake structure during drought years. Since this water would be taken in the pipeline, there would be no net change in streamflow downstream of the intake structure.

ALTERNATIVE 1 WATER SUPPLY SYSTEM (20,000 Ac-Ft/Yr from San Juan River and 15,000 Ac-Ft/Yr Ground Water)

HYDROLOGY

Operation, Maintenance, Abandonment

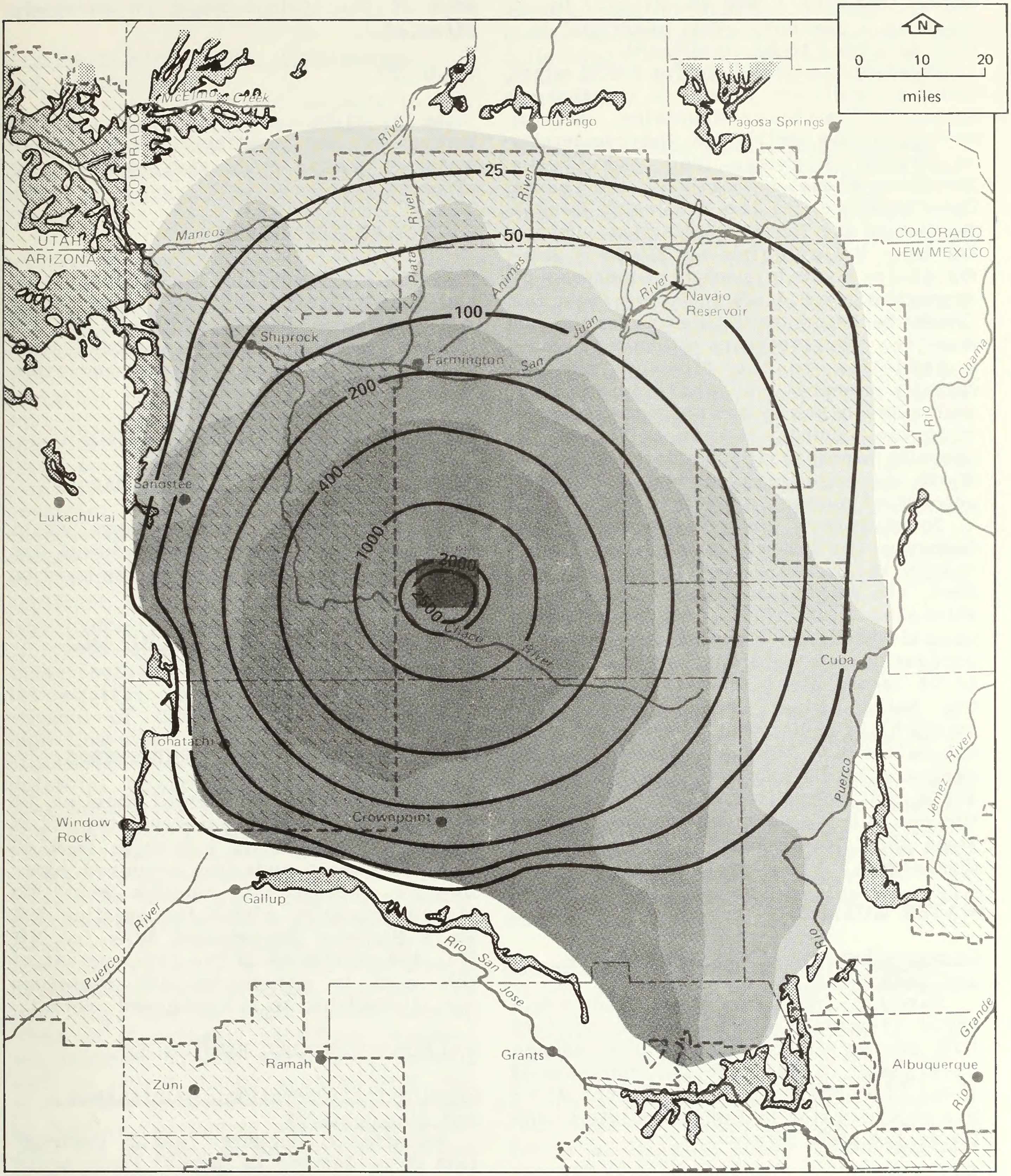
The alternative water supply from the well field (16 wells that would be completed in the Westwater Canyon Member of the Morrison Formation) would result in significant impacts (drawdowns greater than 25 feet) to ground-water users whose wells tap the Westwater Canyon Member, the Dakota Sandstone, and the Entrada Sandstone aquifers in the San Juan Structural Basin (Map 3-2). Significant impacts would occur over almost the entire basin in all three aquifers. The maximum drawdowns in the Westwater Canyon Member would occur in the vicinity of the well field in year 2033, when pumping for NMGS would be reduced from 15,000 to 6250 acre feet per year (ac-ft/yr). These maximum drawdowns would be approximately 3000 feet in the vicinity of the well field.

The maximum drawdowns in the Dakota Sandstone and Entrada Sandstone aquifers would also occur in the vicinity of the well field used for NMGS. The maximum drawdowns in the Dakota Sandstone would be approximately 400 to 600 feet and would occur in year 2038, at about the time when all pumping from the well field would cease. The maximum drawdowns in the Entrada Sandstone would be approximately 150 to 200 feet and would occur 10 to 20 years after cessation of pumping from the well field for NMGS.

Measurable land subsidence probably would result from withdrawal of ground water from the well field for NMGS. Based on the substantial projected declines in the potentiometric surface of the Westwater Canyon Member aquifer due to pumping for NMGS, the San Juan Structural Basin has been assigned a moderate potential for land subsidence. It is not known whether such subsidence might be significant (greater than 1 foot). A more quantitative estimate of the magnitude or geographic extent of possible land subsidence cannot be made without additional information on rock properties of the aquifer system. Any land subsidence that results from pumping ground water for NMGS most likely would be irreversible.

The duration of significant impacts to ground-water users whose wells are completed in the Westwater Canyon Member, the Dakota Sandstone and the Entrada Sandstone could be 150 years or more after the pumping from well field for NMGS stops. The duration of drawdowns greater than 25 feet due to pumping for NMGS cannot be accurately quantified with the model used for this EIS.

A beneficial impact of pumping from the well field for NMGS would be a lessening of the dewatering requirements of existing and proposed future uranium



LEGEND

Indian Reservations

NMGS Well Field

Outcrop includes Morrison, Wanakah, Summerville and Entrada Formations

Time of Maximum Drawdown

before 2033
2034–2038
2039–2048
2049–2068
2069–2108
after 2109

—100— Line of equal drawdown in feet

Map 3-2. MAXIMUM CALCULATED DRAWDOWNS DUE TO NMGS

mines (Baseline 1 and Baseline 2) by as much as 5 percent. This beneficial impact is judged to be significant.

Pumping the well field for NMGS might cause a significant impact on the flow of springs in the Chuska Mountains. Several springs in the vicinity of the community of Crystal discharge from the Chuska Sandstone where, geologically, the Chuska Sandstone overlies the Westwater Canyon Member of the Morrison Formation. Pumping from the well field for NMGS is estimated to cause a maximum increase of approximately 0.4 cfs in inflow from the Chuska Sandstone to the Westwater Canyon Member. This increased inflow may cause a reduction in the flow of several springs; however, available information on the hydrogeology and average discharge of these springs is not sufficient to quantify whether the reduction in flow would be significant (greater than 15 percent of average daily flow).

Pumping from the well field would also decrease the natural ground-water discharge to the San Juan River, Rio San Jose, Rio Puerco, and Puerco River by an estimated 0.09 cfs. This decrease in natural discharge may be overestimated because ground-water discharge is assumed to be taking place from the Rio Puerco and Puerco River, even through these streams are ephemeral where they cross the outcrops of the aquifer system. (No decrease in discharge to the Rio Salado River was identified.) This decrease would not be a significant impact (less than 15 percent of average daily discharge).

WATER QUALITY

Construction/Operation, Maintenance, and Abandonment

Pumping from the well field would result in leakage from adjacent aquifers with poorer water quality. The leakage could result in maximum TDS increases of about 5 percent in Westwater Canyon Member ground water in the immediate vicinity of the plant site.

VEGETATION

If a reduction of flow from springs would occur, vegetation in the immediate area of the springs could be adversely affected.

WILDLIFE

In addition, wildlife that use the springs and any associated vegetation for water or forage could also be adversely affected.

CULTURAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

An adverse impact to users of the Chuska Mountain springs as sacred sites could result if there would be reduction in the flow.

SOCIAL AND ECONOMIC CONDITIONS

Construction/Operation, Maintenance, and Abandonment

Increased costs to well users would result from the predicted drawdowns due to increased pumping costs or the need to lower well depths.

PROPOSED INTAKE STRUCTURE AND WATER PIPELINE P1

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 5 miles of pipeline P1 crosses recoverable coal deposits. It is estimated that about 5 million tons of strippable coal underlies proposed pipeline P1. Since this pipeline would be placed primarily within the existing NM State Highway Department ROW for NM 371, the preclusion of the development of this coal is preexisting and therefore not attributable to the proposed project.

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 31 and 33 (Map 3-1). The rest of P1 would cross areas of moderate sensitivity.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 2-8).

HYDROLOGY

Construction

During construction of the proposed intake structure and river diversion site, impacts due to increases in flood elevation and peak discharge of the San Juan River and decreases in recharge to the alluvial aquifer along the San Juan River may occur because of river diversion structures that may be required to construct the intake. Impacts due to changes in flood elevation and peak discharge at the intake sites have not been evaluated quantitatively because the applicant is planning to carefully analyze hydraulic conditions in the vicinity of these sites during final design of these facilities. Recharge to the alluvial aquifer in and adjacent to the channel of the San Juan River during high-flow stages may be decreased by construction activities. Although these potential impacts may be significant, they would be of limited duration, occurring only during construction of the intake structure and river diversion site.

Where proposed water pipeline route P1 crosses De-na-zin Wash, pumping of water from the alluvium of the wash during construction of the pipeline crossing may lower the water level in one well that is completed in the alluvium. This well was hand dug, and its depth is not known. Since it is probably relatively shallow, the lowering of the water level in this well is judged to be a significant impact. The duration of this impact would be limited, extending several weeks beyond the 14 days (maximum) of pipeline construction at this crossing.

Proposed water pipeline route P1 and alternative routes P2 and P3 would cross other streams, washes, and/or arroyos. Because of the design and construction procedures to be used, significant impacts on flooding potential would not occur (refer to Hydrology Technical Report, Section 6.C). Floodplains of these ephemeral-stream crossings are delineated on flood hazard boundary maps, which are available for inspection at the BLM NMSO.

Operation, Maintenance, Abandonment

Impacts could occur due to the location of the intake structure and diversion facilities (diked or raised) in the 100-year floodplain of the San Juan River. Impacts could result from a change in flood elevation and extent of the existing floodplain up or downstream from the proposed intake. If these changes occurred, structures and environmental features (e.g., stream bed/banks and associated vegetation) could be adversely affected. Details regarding the design of these facilities or regulation of future flood flows by Navajo Reservoir do not currently allow an evaluation of the significance of potential impacts. The applicant has, however, committed to design studies which would be initiated before construction could begin (during Section 404 permitting process).

WATER QUALITY

Construction

Construction of the water supply diversion facilities at the proposed intake site would cause short-term increases in the turbidity and suspended solids levels of the San Juan River immediately downstream from the headgate construction activities. Similar turbidity increases would be expected if an alternative location for the intake structure were chosen.

Operation, Maintenance, Abandonment

The withdrawal of up to 35,000 acre-feet of water from the San Juan River would increase average levels of total dissolved solids (TDS) downstream along the Colorado River. These increases (a maximum of 4 mg/l at Imperial Dam, or less than 1 percent of the total TDS levels at Imperial Dam) would increase the net cost of Colorado River water use for Lower Basin users due to increased treatment costs (see the Water Quality Technical Report). The Bureau of Reclamation views these TDS increases, resulting from the salt-concentrating effect, as an allowable result of each state's use of available Colorado River

system water. Similar downstream TDS increases would be expected if an alternative location for the intake structure were chosen.

VEGETATION

Construction

No significant impacts were identified because the amount of riparian vegetation removed would be small and no locally unique or rare species would be disturbed.

Operation, Maintenance, Abandonment

Loss of existing riparian vegetation downstream of the proposed intake is not expected because no appreciable decrease in minimum flows downstream of the intake would occur (Hydrology Technical Report).

It is also unlikely that natural replacement of riparian vegetation, particularly cottonwoods, would be diminished due to reductions in peak flow. Reductions of annual overflows and natural channel movements have been reported to curtail the formation of cottonwood seedling habitat (Ohmart et al. 1977). However, an average 48 cfs reduction in stream flows of 3700 cfs or more would be less than 1.3 percent of a reduction in peak flows and would probably not result in observable impacts to replacement of riparian habitat. Stream flows of 3700 cfs were exceeded 10 percent of the time between 1963 and 1981 at the Farmington gaging station below the mouth of the Animas River (USGS 1981b). During heavy runoff years, peak flows of approximately 10,000 cfs have been maintained for up to 7 days.

WILDLIFE

Construction

If construction activities are scheduled during the period December 1 - March 31, when mule deer are concentrated on crucial winter range, disturbances could add winter stress and displace animals from the construction area.

Operation, Maintenance, Abandonment

Impacts to this mule deer crucial winter range would include long-term (i.e., greater than 5 years) removal of browse species used for survival on winter range. Impacts to crucial winter range were not identified as significant impacts according to the indicators of significance defined in Appendix D because less than 1 percent of the regional winter range would be disturbed.

Based on projections of water flow in the San Juan River presented in the Hydrology Technical Background Report, impacts to aquatic biota would be:

- A potential beneficial impact to the trout fishery between Navajo Dam and the proposed NMGS intake because of an increase in the amount of water (i.e., 48 cfs) during periods of low flow. This quantity of water would not maintain the trout fishery by itself, but it would contribute to the minimum required. This same potential would occur in the warmwater fishery downstream of the trout fishery.

There would be no effect on aquatic biota below the intake site because flow rates below the intake structure would not be significantly altered on an average basis.

The operation of the NMGS intake would not be expected to result in long-term significant impacts to fishery resources as a result of impingement and entrainment. The fishery in the vicinity of the intake is not considered to be highly valued, and is of local importance. The fish fauna is dominated by carp and suckers.

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Mesa Verde Cactus. Potential impacts are identified for Mesa Verde cactus (Threatened and Endangered Species Technical Report). If this species is present within potential habitat along the P1 corridors, impacts could include:

- Direct destruction of unidentified populations or individuals
- Accelerated erosion in areas supporting the species
- Removal of local populations by cactus collectors

Bald Eagle. As a relatively common winter resident in the vicinity of the proposed intake structure, the bald eagle is often associated with San Juan River

riparian habitat and depends on fish in the river as part of its prey base. No impacts to this riparian habitat or prey base are expected because no appreciable decrease in San Juan River minimum or peak flows would occur due to proposed water withdrawal for the NMGS. Detailed discussion of this topic is contained in technical reports for hydrology, vegetation, and wildlife resources.

Colorado River Squawfish. No impacts are identified for the Colorado River squawfish because the species has been extirpated in the vicinity of the proposed intake.

Devil's Claw Cactus. No impacts are identified for this cactus because its distribution is limited to north of the San Juan River.

CULTURAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Construction of the proposed water supply system would have significant direct adverse impacts to cultural resources due to disturbance or destruction of subsurface sites. However, once built, maintenance of the proposed intake would probably have few additional adverse effects.

ALTERNATIVE INTAKE STRUCTURE AND PIPELINE P2

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 5 miles of pipeline P2 crosses recoverable coal deposits. It is estimated that about 5 million tons of strippable coal underlies alternative pipeline P2. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as pipeline P2 (i.e., PNM could be required to relocate the pipeline or compensate the lessee).

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 33.5 and 35.5 (Map 3-1). The rest of P2 would cross areas of moderate sensitivity.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 2-8).

HYDROLOGY

Operation, Maintenance, Abandonment

Use of the alternative point of diversion at Bloomfield may result in shortages to users of water from Navajo Reservoir during a severe drought period. There is a low probability that such shortages would occur; however, the magnitude of these shortages cannot be estimated with the operations model of the San Juan River system used in this impact analysis. The basis for predicting these possible shortages is that water from irrigation return flows of other diversions from the San Juan River would not be available at Bloomfield, whereas some of these return flows would enter the river upstream of Farmington. The duration of these possible shortages probably would be several isolated or consecutive months during a severe drought period.

VEGETATION

Construction/Operation, Maintenance, and Abandonment

Impacts on the natural replacement of riparian vegetation would be the same as those discussed for the proposed intake. However, the zone where impacts could occur includes the additional area downstream from the alternative intake to the proposed intake.

WILDLIFE

Construction

Impacts would be the same as those discussed for P1 and the proposed intake, but the area of impact would differ (Map 2-8).

Operation, Maintenance, Abandonment

Impacts would be the same as those discussed for P1 and the proposed intake, except the impact zone would be modified because the location of the alternative intake is upstream from the proposed intake (Map 2-8).

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Refer to the discussion for P1 (proposed action).

ALTERNATIVE INTAKE STRUCTURE AND P3

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

Steep-sided slopes and high landslide potential in Kutz Canyon near Bloomfield on route P3 represent significant geologic hazards to construction and operation.

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 4.5 miles of pipeline P3 crosses recoverable coal deposits. It is estimated that about 4.5 million tons of strippable coal underlies alternative pipeline P3. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as pipeline P3 (i.e., PNM could be required to relocate the pipeline or compensate the lessee.

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 3 and 16. The rest of P3 would cross areas of moderate sensitivity.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 28).

WILDLIFE

Construction

Impacts would be the same as those discussed for P1 and the proposed intake, except that the area where impacts could occur would differ (Map 2-8).

Operation, Maintenance, Abandonment

Impacts would be the same as those discussed for P1 and the proposed intake, except that the impact zone would be modified (Map 2-8).

PROPOSED AND ALTERNATE TERMINAL STORAGE RESERVOIRS

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Refer to the discussion for P1 (Proposed Action).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-8). Potential impacts and reclamation problems associated with soils obtained from borrow areas are unknown at this time.

TRANSMISSION SYSTEM

PROPOSED TRANSMISSION LINE T1

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

Slumping of banks in the Kimbeto Wash could be a potential hazard to tower structures.

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Approximately 12.5 miles of transmission line T1 crosses recoverable coal deposits. It is estimated that about

13.8 million tons of strippable coal underlies proposed transmission line T1. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as transmission line T1 (i.e., PNM could be required to relocate the transmission line or compensate the lessee).

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between mileposts 13 and 65 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-9).

WILDLIFE

Construction/Operation, Maintenance, and Abandonment

Wildlife habitat removal within the ROW would not constitute a significant impact. Other impacts, such as increased hunting and fishing pressure, human-related disturbances, and disturbance to nesting raptors, would be similar to those discussed for the NMGS facility. The number of raptor nests that could be affected for T1 and other alternative transmission lines is given in Table 1-9. Impacts to wildlife resources would be similar on each of the transmission line alternatives, except where specific differences are noted.

CULTURAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Construction and maintenance of the proposed transmission system including access roads, would have a moderate to minimal direct adverse effect on the culture historical resources if the system were designed to avoid them.

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

The proposed and alternative 500-kV transmission lines, with 80-to 150-foot-high guyed-vee, lattice-steel or tubular towers every quarter-mile (approximately) would result in visual contrasts to a majority of landscapes in the area of influence.

The forceful vertical and angular shapes (forms) of the towers would not repeat the natural, more subtle, elements in the landscape and would be a visible technological contrast with the prehistoric roads and architecture, and traditional Native American sites of the region. Contrast ratings in "form" range from 8 to 12 for tower structures. The lines of specular conductors would be clearly visible from up to 5 miles away and would result in a dominant feature introduced across the landscape (or skyline). Where study areas parallel existing transmission lines, pipelines, or roadways, the extent of change would be additive, but in most instances impacts would be of less significance than the introduction of a new line in an otherwise natural setting. Because a major portion of the landscape in this region is flat to rolling and vistas are expansive (130 miles), the perspective of the transmission line from ground level would have strong contrasts in both form and line as seen on the horizon against clear blue skies. For perspectives from higher elevations, such as mesas, the line created by the linear conductor cables would slice across the open landscape in unnatural and contrasting patterns.

Visual contrast ratings were completed for sections of the proposed and alternative transmission line study areas that traverse high-quality scenic landscapes and those within areas of high public interest or visibility. The section of ROW between mileposts 90 and 95 would overlap the western edge of Ojito WSA (Figure 3-3). Table 3-7 summarizes significant visual impacts for T1.

WILDERNESS VALUES

Construction/Operation, Maintenance, and Abandonment

The T1 study area includes the western boundary of the Ojito WSA; but under BLM Interim Management Guidelines for WSAs, no transmission line could be located within the WSA. A long-term impact would still occur, because the proposed facilities (150-foot towers and 3- and 4-inch conductor bundles) would change the quality of the scenic experience within the WSA. Since the topography and orientation of the Ojito WSA would help mask the view from within the unit, the T1 line would not significantly impair the wilderness characteristics. Only the top portion of the four to six towers would be visible from the highest elevations within the WSA (Bernalillito Mesa), looking toward Cabezon Peak to the northwest. This vista point is not one of the primary scenic spots in the study area.

Short portions of T1 would come within 3 miles of the De-na-zin, Ah-shi-sle-pah, and La Lena WSAs. These portions would not significantly impair wilderness characteristics, but they would change the scenic quality of the landscape as viewed from elevated portions along the southern border of De-na-zin, from the southern tip of Ah-shi-sle-pah, and from the northwestern corner of La Lena.

PROPOSED TRANSMISSION LINE T2

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Impacts (e.g., destruction of or damage to fossils) could occur in moderate-sensitivity zones from MP 0 to 1 and 20 to 50 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-9).

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Table 3-7 summarizes significant visual impacts for T2.

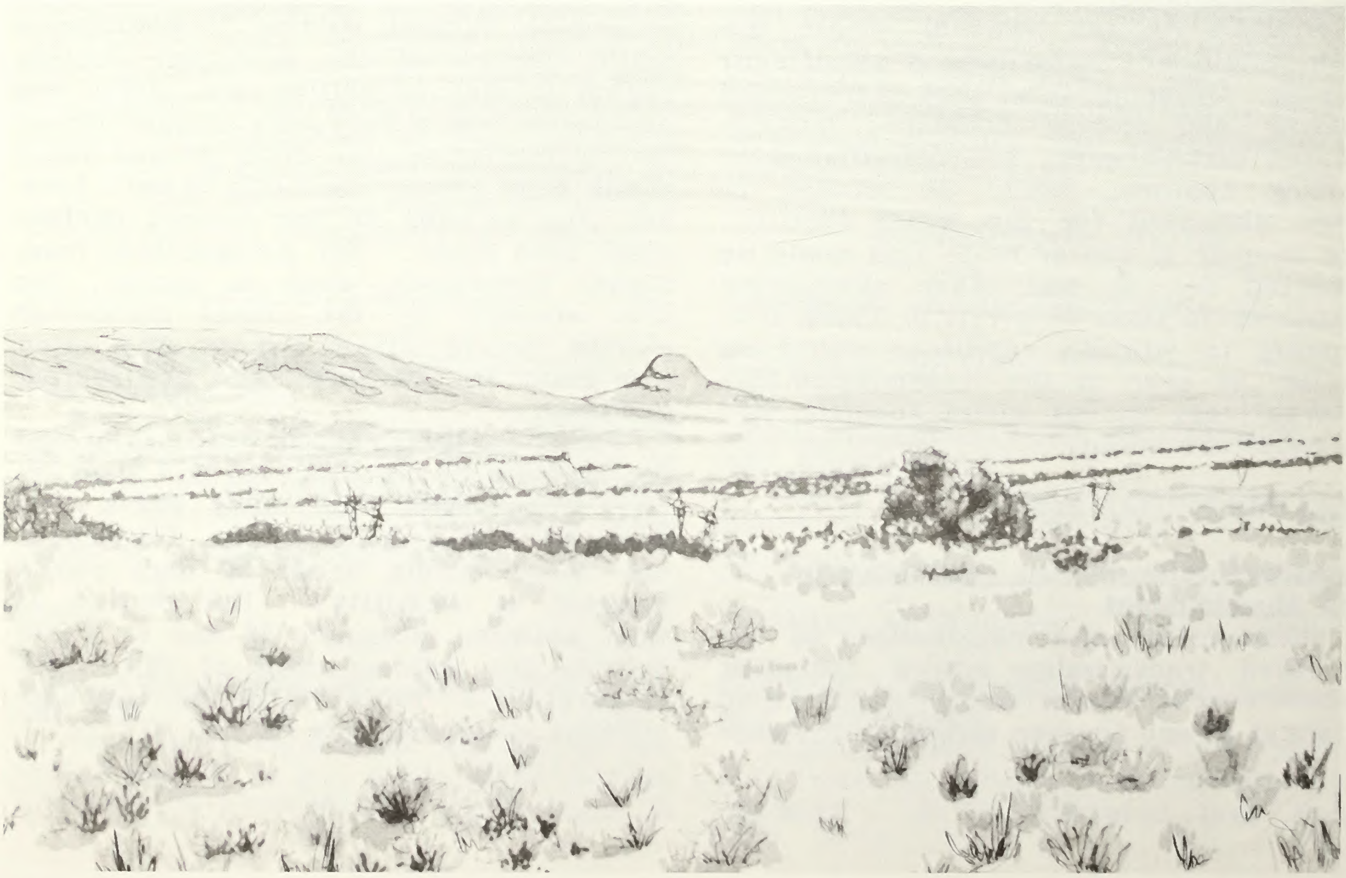


Figure 3-3. T1 LINE FROM OJITO WSA

Table 3-7. SIGNIFICANT VISUAL IMPACTS FOR TRANSMISSION LINE STUDY AREAS

Study Area	Milepost	Contrast Rating	VRM Class/ Allowable Contrast	Notes
T1	0 - 10	23	IV (20)	Borders De-na-zin WSA along county road
	90 - 95	21	II (12)	Overlaps Ojito WSA
	80 - 90	21	IV (20)	Visible from top of Cabezon WSA
				Crosses proposed Continental Divide National Scenic Trail corridor
T2	75 - 85	21	II (12)	Passes within 2 miles of CCNHP Pueblo Alto and Pueblo Pintado sites, and Pierre's site
				Overlaps eastern edge of Cabezon WSA; visible to hikers and photographers
				Crosses proposed Continental Divide National Scenic Trail corridor
				Visible from Ojito WSA
T3	40 - 60	24	II (12)	Crosses below western rim of scenic Chaco Mesa
				Crosses proposed Continental Divide National Scenic Trail corridor
	80 - 85	21	II (12)	Overlaps Cabezon WSA; similar to T2
	90 - 95	21	IV (20)	Visible from Ojito WSA
T4	20 - 25	21	IV (20)	
	65 - 75	21	II (12)	San Mateo Mesa
				Crosses proposed Continental Divide National Scenic Trail corridor

WILDERNESS

Construction/Operation, Maintenance, and Abandonment

The T2 study area overlaps the eastern boundary of Cabezon Peak WSA; however, under BLM's Interim Management Guidelines for WSAs, no transmission line could be built within the boundary. Further, the line would have significant scenic consequences as viewed from atop Cabezon Peak. Since one of the primary uses of the WSA is climbing the volcanic plug for a scenic view of the surrounding landscapes, the visual imprint of man's work would impair the scenic and natural character of the view (see Visual Resources).

ALTERNATIVE TRANSMISSION LINE T3

MINERAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

About 2 miles of T3 crosses recoverable coal deposits. It is estimated that about 3.8 million tons of strippable coal underlies T3. The BLM Chaco-San Juan Management Framework Plan decision precludes the usurpation of coal resources by linear projects such as T3 (i.e., PNM could be required to relocate the transmission line or compensate the lessee).

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Impacts (e.g., destruction of or damage to fossils) could occur in moderate-sensitivity zones between MP 0 and 1 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind or water erosion susceptibility (Table 2-9).

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Table 3-7 summarizes significant visual impacts for T3.

ALTERNATIVE TRANSMISSION LINE T4

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

T4 would have the greatest potential for landslides or spontaneous combustion of coal that could damage towers and transmission lines.

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant (e.g., destruction of or damage to fossils) impacts could occur in high-sensitivity zones between MP 0 and 3 (Map 3-1).

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of steep terrain or high wind or water erosion susceptibility (Table 2-9).

WILDLIFE

Construction

If construction activities are scheduled during the period December 1-March 31, when deer are concentrated on crucial winter range, noise and general human presence could further aggravate winter stress.

Operation, Maintenance, Abandonment

Impacts to mule deer and elk crucial winter range would include long-term (greater than 5 years) removal of browse species critical for survival on winter range. Impacts to crucial winter range were not identified as significant because less than 1 percent of the available range in the regional base for comparison (Appendix D) would be disturbed.

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Potential impacts to Mesa Verde cactus are discussed earlier under the proposed intake structure and pipeline P1.

VISUAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Table 3-7 summarizes significant visual impacts for T4.

RECREATION RESOURCES

Construction/Operation, Maintenance, and Abandonment

Alternative T4 would traverse the Cibola National Forest. However, because this alternative would parallel an existing power line and would not cross any of the developed recreation sites or trails, it would not significantly affect recreational activities.

PROPOSED TRANSMISSION LINE T5

PALEONTOLOGICAL RESOURCES

Construction/Operation, Maintenance, and Abandonment

Significant impacts (e.g., destruction of or damage to fossils) could occur in high-sensitivity zones between MP 0 and 3.

SOILS

Construction/Operation, Maintenance, and Abandonment

Potentially significant impacts to the soils resource (e.g., accelerated erosion and reduced productivity) would occur in areas of high wind erosion susceptibility (Table 2-9).

THREATENED AND ENDANGERED SPECIES

Construction/Operation, Maintenance, and Abandonment

Potential impacts are discussed earlier under the proposed intake structure and pipeline P1.

RIO PUERCO STATION

GEOLOGIC SETTING

Construction/Operation, Maintenance, and Abandonment

There may be potential for damage or collapse of structures associated with the Rio Puerco substation that may be built over active fault traces in the Rio Puerco fault zone.

NET ENERGY ANALYSIS

The net energy analysis for NMGS considered the three major systems: coal transportation, water transportation, and electricity generation. The major emphasis was on the primary energy flow (coal to electricity), with some discussion of major ancillary energy inputs and energy that would be used in construction. Based on this analysis, the ratio of energy outputs to energy used would be 0.305.

LAND USE CONTROLS AND CONSTRAINTS

The CEQ Regulations require that potential conflicts between the Proposed Action and alternatives and the objectives of approved federal, state, local, and tribal land use plans, policies, and controls be identified. While it would be necessary to acquire a variety of access approvals (see Authorizing Actions, Section 1.2) to implement the Proposed Action and alternatives, these do not constitute conflicts (i.e., nonpermissible activities) with existing land use plans or controls.

Approved land use plans in force in the affected area include the BLM Management Framework Plans (MFPs) for the Chaco-San Juan, Rio Puerco, and Cabezon Planning Units. There is also a land use plan in effect for the Cibola National Forest. No conflicts were identified for plans in effect in Cibola National Forest, since the only transmission line alternative that would cross forest land (T4) would be located in an approved corridor. Transmission line study areas for T1 and T2 have potential conflicts with both BLM Management Framework Plans and BLM interim management guidelines for WSAs because of overlap with the boundaries of Cabezon and Ojito. However, since transmission lines would not be allowable under these interim guidelines, there would be no conflict.

The Chaco-San Juan Planning Unit MFP covers the area potentially affected by the proposed plant site, reservoir, and a portion of the ROWs. The plan provides for BLM consideration of these types of

potential uses, based on the stated assumption that the grantee would be responsible for any necessary relocation and other special considerations involved in preserving the values of ACECs. (The Bisti and De-na-zin WSAs and the Fossil Forest are recommended ACECs.)

The Chaco-San Juan Planning Unit MFP also covers the water pipeline ROWs for P1, P2, and P3 and the transmission line study areas for T1 and T3 where they cross recoverable coal deposits. The Chaco-San Juan MFP decision precludes the usurpation of coal resources by these linear project components (i.e., PNM could be required to relocate the lines or compensate the lessee).

From the BLM perspective, use of lands for the proposed NMGS would not result in any conflict with existing land use controls and constraints. In March 1982, BLM proposed that the lands proposed for the Ute Mountain Land Exchange be withdrawn in order to segregate the lands for a proposed exchange with Paragon Resources. From the Navajo perspective, use of this land for the proposed NMGS could be perceived as a potential conflict with Navajo tribal plans and policies for use of these lands, in that this action would preclude their option to acquire these lands as part of the settlement for the Navajo-Hopi land dispute resolution. This issue is discussed further in the Land Use Technical Report.

ALTERNATIVE STATION SITES

In addition to the Bisti site, the BLM has identified and reviewed over 22 sites. The full site review process is described in the Site Selection Technical Report. Of these sites, two sites, Torrance and McKinley, appeared to have the best prospects as alternatives. The purpose of this discussion is to enable the public and the decision makers to consider the suitability of the Bisti site in comparison to other possible sites (Table 3-8). The environmental analysis for these alternative sites is not, however, of sufficient detail that this EIS alone would allow BLM approval of the necessary ROWs for those sites. If the BLM rejects the Bisti site, and if PNM decides to pursue any alternative site that would need BLM ROWs, additional environmental analysis would be required.

Descriptions of the Torrance and McKinley alternative plant sites follow.

TORRANCE SITE

The Torrance site is located in the Estancia Basin in Torrance County, New Mexico.

Climate/Air Quality

Elevations near this site range from about 6800 to 7000 feet, sloping steadily upward from east to west. The terrain continues to rise steeply to the west and northwest, reaching an elevation of over 10,000 feet at Manzano Peak, about 7 miles northwest of the site. The downslope is more gradual east and southeast of the site. The site area itself is entirely open with no restricted topographic features. However, the Manzano Mountains (extending north-south) are due west of the site, with elevations ranging between 9000 and 10,000 feet. It appears, from observation and the climatological data of the area, that a persistent wind pattern may exist, with the southeast upslope winds during the daytime and northwest downslope/drainage the nighttime and early morning periods. These persistent drainage winds, and the higher terrains to the west, could result in poor dispersion in the area.

Geologic Setting

The site is near or within the Rio Grande rift area, which is an active tectonic rift zone with poorly defined margins and a poorly defined level of geologic activity. A major fault of undetermined capability is located along the crest of the Manzano Mountains. Possible faults are also located along Abo Canyon and Mesteno Draw. Both of these faults are located within 5 miles of the site.

Poor or discontinuous bedrock exposures in the Abo Sandstone were found at or near the site. A widespread and well-defined pediment was observed within the site area. Its age is estimated to be 2 million to 4 million years. However, its thickness and traceability are not known.

No unconsolidated alluvial deposits are believed to underlie the site, thus resulting in a low potential for liquefaction or subsidence. Limestone is said to underlie the Abo Sandstone; however,

Table 3-8. COMPARISON OF SITE ALTERNATIVES

Environmental Resource Topics	Site Alternatives: Torrance	McKinley	Bisti
Climate/Air Quality			
Potential for stagnant air conditions based on considerations of terrain and anticipated air circulation patterns	Moderate	Low	Low
Geologic Conditions			
Potentially active faults within 5 miles of the site area	Yes	No	No
Potential for liquefaction or subsidence	Low	Low	Low
Presence of sink holes	Occasional	None	None
Minerals			
Presence of surface or subsurface mineral resource in the site area	No	Yes	Yes
Hydrology			
Water source	Ground water from the Estancia Basin	San Juan River and/or ground water from the Westwater Canyon Member of the Morrison Formation, Gallup Sandstone, and Entrada Sandstone	San Juan River and/or ground water from the Westwater Canyon Member of the Morrison Formation
Potential for ground subsidence that could result from ground-water use	Yes	Yes	Yes
Volume of water recoverable to wells from the potential ground-water source	2.9 million acre-feet	5.0 million acre-feet (Westwater Canyon Member)	5.0 million acre-feet (Westwater Canyon Member)
Average yield of wells that penetrate the potential ground-water source	800 gallons per minute	200 gallons per minute or greater	200 gallons per minute or greater
Water source development based on transmissivity, well spacing, well depths, and pumping lifts.	Characteristics of the basin are fair for development of a ground-water supply	Characteristics of the basin are poor for development of a ground-water supply	Characteristics of the basin are poor for development of a ground-water supply

Table 3-8. COMPARISON OF SITE ALTERNATIVES (concluded)

Environmental Resource Topics	Site Alternatives		
	Torrance	McKinley	Bisti
Vegetation			
Presence of any sensitive or unique vegetation within the site area	No	No	No
Wildlife			
Presence of any crucial wild-life habitat within the site area	No	No	No
Threatened and Endangered Species			
Number of species that occur or have potential habitat in the site area	0	0	0
Cultural Resources.			
Survey coverage for cultural resources	No comprehensive surveys for the site	Limited surveys	Extensive surveys
Number of recorded sites	0	Several	> 40 sites
Social and Economic			
Commuting distance to the nearest population center with adequate support in labor force, infrastructure and facilities	65-70 miles (Albuquerque)	50-60 miles (Grants/ Milan)	35 miles (Farmington)
Population of nearest population center	331,767 (Albuquerque)	15,200 (Grants/Milan)	35,000 (Farmington)
Major economic activity in the region surrounding the site area	Agricultural	Minerals development/ livestock grazing	Coal mining/livestock grazing
Land Use			
Current use of the site area	Agriculture	Livestock grazing	Livestock grazing
Land status of site area	Predominantly private land	State and private land	Public lands

there are no known solution occurrences in this limestone. The site has a mild to rough topography, with occasional sinkholes.

Mineral Resources

The subsurface of the Torrance site is probably nonmineral in character. The overall suitability of the site is not affected by the presence of mining claims or other subsurface resource-related encumbrances.

Hydrology

The potential source of water supply for the site would have to be from mining of ground water from the Estancia Basin. The basin is a declared underground water basin under the jurisdiction of the New Mexico State Engineer. The basin is topographically closed and is filled with late Tertiary and Quaternary alluvial and lacustrine deposits (valley fill) that overlie Paleozoic bedrock. The relatively flat Estancia Valley occupies the center of the basin and is elongated in a north-south direction. This flat valley floor is interrupted in the southeastern quarter of the basin by playas, which occupy depressions up to 40 feet deep.

The valley fill aquifer of Pliocene to Holocene age is the principal water-bearing formation in the Estancia Basin. Locally, the underlying Pennsylvanian Madera Limestone and Permian Glorieta Sandstone are productive aquifers, due mainly to solution cavities and fractures. The following discussion pertains only to the valley fill aquifer.

The saturated thickness of the valley fill aquifer ranges from zero to 360 feet. The average saturated thickness based on values for each administrative block in the basin is about 200 feet. The volume of ground water stored in the valley fill aquifer is approximately 5.4 million acre-feet. This volume has been computed using values of saturated thickness for each administrative block and a specific yield of 0.125. South of Estancia, about 2.9 million acre-feet of this ground water would be recoverable to wells. The average yield of wells that penetrate the valley fill aquifer is about 800 gallons per minute. Water quality in the western part of the Estancia Basin is good for irrigation but becomes poorer toward the center of the basin.

The principal source of recharge to the valley fill aquifer is infiltration of direct precipitation and intermittent stream flow in the Manzano Mountains and foothills in the western part of the Estancia Basin. The infiltrated water enters the Madera Limestone and eventually recharges the valley fill aquifer by subsurface inflow. The amount of recharge that occurs from precipitation is probably small.

Discharge from the valley fill aquifer occurs principally from pumpage of ground water for irrigation and by evaporation from the playas. A minor amount of ground water is discharged by subsurface outflow from the northern portion of the Estancia Basin to the Santa Fe trough. The largest use of ground water is for irrigation. Most of the irrigation wells that penetrate the valley fill aquifer are located parallel to and west of NM 41. Pumping from this concentration of wells has resulted in a decline in water levels of about 1.5 feet per year.

The State Engineer's criteria for administering new appropriations in the Estancia Basin and the impairment of existing water rights are well defined. According to state regulations, the lowering of water levels in existing wells from additional appropriations in quantities permitted by the State Engineer does not constitute impairment in a ground-water basin that the State Engineer considers to be nonrechargeable.

The hydrologic characteristics of the basin are only fair for development of a reliable and dependable water supply. The saturated valley fill on the average exhibits relatively moderate transmissivity. The relatively small area and saturated thickness of the basin probably are the major constraints to the development of a ground-water supply.

The development of water supply for uses other than agriculture would introduce competition for water in a traditionally agricultural community. The mining of water over a long period would introduce additional adverse effects of potential ground subsidence.

Vegetation

Vegetation on the site is dominated by agricultural species. There appears to be little ecological sensitivity to plant construction and operation activities.

Wildlife

No crucial wildlife habitat is present in the Torrance site area.

Threatened and Endangered Species

No threatened or endangered species are known to occur in the Torrance site area.

Cultural Resources

No archaeological or historic sites are recorded for the site. Records indicate that the site area has not been comprehensively surveyed, nor have any significant surveys been documented for the general surrounding terrain.

The Torrance site is located in the region of the Salinas National Monument. This national monument includes several former New Mexico state monuments which are primarily late prehistoric or early historic pueblos that have been grouped as the Salinas Pueblos. The closest of these to the Torrance site area would be the Abo and Quarai Pueblos, located approximately 10 miles southwest and 4 miles west of the site. In addition, La Cienaga Mission is located about one-half mile north of the site.

Social and Economic Conditions

The site area is not close to any pertinent population; however, it is close to three transient-population generators (Cibola National Forest, Manzano State Park, and Quarai Pueblo).

The site is located southeast of Albuquerque in a predominantly agricultural area. The area is characterized by some grazing and irrigated farming. The area is accessible to Albuquerque by highway with an approximate commute distance of 65-70 miles. Nearby towns include Mountainair, Willard, and Estancia. The area is generally characterized as relatively economically depressed. Should industrial development take place in this region, it is expected that considerable support in labor force and infrastructure services and facilities would have to come from Albuquerque (population 332,000) because of the absence of other nearby population centers that could provide adequate support and facilities.

Land Use

The site is located predominantly on private lands. Most of the land adjacent to and within 5 miles of the site is either private (70 percent) or Forest Service (27 percent) land; 3 percent is state land. Facilities that are in proximity to the site area include an airfield, two highways (including U.S. 60), the Atchison, Topeka and Santa Fe Railroad, a transmission line, two gravel pits, and four gas pipelines.

There are various types of restricted lands in proximity to the site. The western boundary of the site borders on the southwestern portion of the Cibola National Forest. Almost all of the land immediately east of the site is private except for small scattered parcels of state land. The Quarai Pueblo and Manzano State Park are within 5 miles of the site area.

The site area is part of a relatively isolated, large region that has little, if any, mineral- or resource-related development, and the region has no previous experience in accommodating large-scale industrial development. In the absence of unforeseen external influences, land use patterns will be expected to remain relatively unchanged from those that presently exist.

McKINLEY SITE

The McKinley site is located in McKinley County, New Mexico, just north of the continental divide.

Climate/Air Quality

The elevation of the McKinley site ranges from about 6500 to 6700 feet. The site terrain rises gradually from north to south. A small peak rises to an elevation of 6900 feet to the south. However, this site generally has an open appearance. The continental divide rises only about 200 feet above the site elevation. The highest elevation along the divide is 8150 feet at a distance of about 15 to 20 miles south of the site. Chaco Mesa is east to northeast of the site at a distance of about 10 miles. There appear to be no major topographic features that would adversely affect dispersion at the McKinley site.

Geologic Setting

The McKinley site is in the Chaco Slope, which forms the edge of the tectonic province, the San Juan Basin. There are no identified local faults or

folds in the area. Bedrock exposures containing numerous resistant sandstone outcrops are present at the site. Consolidated alluvial deposits are not known to underlie the site, thus alleviating concern for liquefaction or subsidence at the site. Additionally, soluble deposits are not known to underlie the site.

Mineral Resources

In the McKinley site area, most of the subsurface rights for exploration and production for uranium, coal, oil, and gas have mostly been conveyed to several major energy companies. Some private mineral rights may susbequently have been leased to other parties. There are no known plans for development of these resources in the near future.

Soils Resource

Poorly defined patchy soils were found within 5 miles of the site. The soils in the vicinity of the McKinley site are estimated to be 300,000 years or younger in age.

Hydrology

Potential water supply would come from either the San Juan River or development of a well field that taps the principal sandstone aquifers in the San Juan Basin. A water supply system utilizing San Juan River water would be similar to that discussed for the proposed NMGS site near Bisti.

The principal sandstone aquifers in the vicinity of the McKinley site are the Gallup Sandstone, the Westwater Canyon Member of the Morrison Formation, and the Entrada Sandstone. Availability of ground water from a well field would depend largely on the number, spacing, and depth of wells.

The principal aquifers in the San Juan Basin are confined and range in depth from less than 200 to more than 3000 feet. The average height of the potentiometric surface of these aquifers is well above the top of the aquifers (available drawdown). Yields of individual wells of 200 gallons per minute or greater are possible because of this large available drawdown of the potentiometric surface. Because the transmissivity of individual aquifers is relatively low, wells probably would be spaced several miles apart to avoid interference and excessive drawdowns. Approximately 5 million acre-feet are estimated to be potentially recoverable from the Westwater Canyon Member. Water quality of the aquifers in the basin is variable and ranges from good to poor, depending mainly on well depth and distance from recharge areas.

The major constraints to the availability of ground water from a well field in the San Juan Underground Water Basin are related to complex legal issues. There is uncertainty in the overall quantity of ground-water appropriations that will be permitted by the State Engineer because that office's criteria for administering the San Juan Underground Water Basin are not completely defined.

Vegetation

The McKinley site is in a semiarid area. Vegetation is dominated by grasses, forbs, cacti, and individual scattered pinyon pine and juniper.

Wildlife

No crucial wildlife habitat is present in the McKinley site area.

Threatened and Endangered Species

No threatened or endangered species are known to occur in the site area.

Cultural Resources

No comprehensive archaeological surveys have been conducted for the McKinley site area; however, several limited surveys have been conducted in the general vicinity and have resulted in recording a few archaeological sites. These sites range in type from Archaic lithic scatters to Anasazi (Chacoan sites and later Mesa Verde type remains) to historic sweat lodges and hogans. In addition, a large cultural resource inventory was conducted 1 mile north of the site area. Nine archaeological sites (historic Navajo and fire pit sites) were recorded in this inventory). Thus, the potential for locating archaeological resources in the course of any detailed follow-up field survey at the McKinley location is high. No historically significant features or structures have been recorded within this site.

Social and Economic Conditions

From a demographic standpoint, there are few people within 5 miles of the

site. Geographically, it is within 30 air miles of the Grants-Milan area, which has had considerable impact by mineral development activities. In the recent past, however, the economic activity related to uranium mining has slowed considerably. The labor force required would be drawn from a sparsely populated area defined by a 75-mile commuting radius. The nearest community, Hospah, is located about 11 miles due northeast. The nearest population center, Grants/Milan (population 15,200) is about a 50-60 mile commute by automobile. The social and economic impact of plant construction and operation would be that associated with rapid population growth and decline. Grants and Milan, the nearby municipalities, would be the focal point of demand for housing, supplies, and community services.

Land Use Controls and Constraints

The site area is located primarily on state and private land. Generally, the land in the site region is about 65 percent private, 28 percent Navajo, 5 percent state lands, and 2 percent BLM-managed public lands.

Facilities near the McKinley site area include two airfields, a power transmission line extending in a north-south direction near the site, Interstate 40, and the Atchison, Topeka and Santa Fe Railroad located about 25 miles south of the site.

HEALTH AND SAFETY

POTENTIAL HEALTH AND SAFETY EFFECTS OF POWER PLANT EMISSIONS

Ambient air quality standards have been established by both the EPA and the NMEID. These standards are mandated by the Clean Air Act. As stipulated in the act, the national ambient air quality standards have been established to protect human health and general welfare with an adequate margin of safety.

Results from public scoping meetings for the EIS indicated that there is public concern about the effect of the proposed power plant on air pollution and the resulting effect on human health. In addressing these concerns, the air quality analysis examined the predicted total concentration levels resulting from the project and compared these levels with the respective state and national standards. Because predicted total concentration levels are not expected to exceed these standards, public health and welfare would not be endangered by the operation of the proposed plant, according to Clean Air Act standards and definitions.

ACCIDENTS

PIPELINE RUPTURE

A rupture of a concrete pipeline such as the one proposed for the NMGS water supply system would generally result from outside forces and not from internal pipeline pressure or corrosion. The potential for rupture due to internal forces is extremely low. If internal forces caused a rupture, the break would manifest itself in the appearance of wet spots on the ground surface, which would be identified during routine line patrols. Any necessary repairs would be made after taking the line out of service.

Presented in the analysis below are representative scenarios for pipeline accidents and the impacts that would be expected. These scenarios are based on worst-case conditions and assume the proposed P1 alignment. There are no important differences in number or significance of impacts for any of the pipeline alternatives.

Breakage at Blowoff or Air Valve Structures

Water could be released by vandals breaking into blowoff or air valve structures and opening valves. Blowoff valves would be located in low spots along the line and would discharge more water through larger pipe and at higher pressure than air valve structures and opening valves. Blowoff structures would be located at natural drainage channels, so the effects of water discharged from them would be minimal. Release of water from air valve structures, which would be located at intermediate summits, would flood the surrounding area to a small extent and would probably cause minor local surface erosion.

Discharge from a fully opened valve at a blowoff structure at Hunter Wash (MP 31.4 and MP 32.3) could be as much as 12 cfs. This discharge from a single

blowoff structure would be about 90 percent of the output of a single pump in each pumping plant. The loss of water would not be sensed at any of the pumping plants. Notification from the patrol crew or from passersby would be the only effective means of detecting damage downstream of the pipeline crossing. Flow from the blowoff structure at MP 5.7 (<8 cfs) might flood the area upstream of Ojo Amarillo Lateral Canal, and if not detected early might overflow the canal bank. Flow from the blowoff structure at MP 7.0 (<8 cfs) would enter Ojo Amarillo Canyon.

Rupture in Manifolds on Pump Discharge Lines

Although no rupture is known to have occurred in manifolds on pump discharge lines similar to the design for the NMGS water supply system, the effects of such an event at one of the four pumping plants were analyzed. This occurrence would represent a worst-case condition.

Intake Pumping Plant

A pipeline break at the intake pumping plant would be detected by operators within a short time, so all the pumping plants could be shut down. The water in the pipeline between the intake plant and booster plant No. 1, amounting to about 33,000 cubic feet, could drain out through the break. Up to 10 minutes could elapse before the pumps could be shut down. Water in the pipeline would be evacuated in about 4 minutes. A total of up to 50,000 cubic feet of water could be discharged in the yard area of the intake pumping plant at an initial rate of about 43 cfs.

Booster Plant No. 1

Assuming a maximum rupture similar in size to that assumed for the intake plant, the pipeline at booster plant No. 1 could lose about 73,000 cubic feet of water in about 33 minutes after the rupture occurred. The maximum rate of outflow from the break would be about 30 cfs. Water probably would flow down the arroyo that discharges downstream of the intake works.

Booster Plant No. 2

A break in the discharge manifold for booster plant No. 2 of the size of the one described for the intake plant would initially discharge water at the rate of about 30 cfs. The 158,000 cubic feet of water in the pipeline between booster plants 2 and 3 would then be released in about 53 minutes. Water would flow into one of the small drainage courses that eventually enter the badlands about 2 miles northeast of booster pumping plant No. 2.

Booster Plant No. 3

Under conditions similar to those described for the other booster plants, a break at booster plant No. 3 could release 82,000 cubic feet of water, at 31 cfs, in about 34 minutes. Water would enter one of the washes near booster plant No. 3 and flow northeasterly 2 or 3 miles to the badlands on the westerly side of Moncisco Wash.

EMERGENCY PROCEDURES

Identification and control of emergency conditions along the main water pipeline route would be the responsibility of the intake plant operator. The control center at the intake plant would be attended 24 hours a day, 7 days a week. Instruments would continuously monitor pipeline pressures and pump status at each intermediate pump station. Instruments would sound alarms any time a deviation occurred in pressure or flow, indicative of an outage or unusual condition in the pipeline system. Indications of an outage could come from any of several sources: a telephone call from a member of the public, a radio alert from an aerial patrol pilot, or an alarm from the instruments. Upon receiving a report from any of these sources, the operator would immediately implement emergency procedures. The first priority would be to secure the area to reduce the possibility of damage to persons or property.

RESERVOIR FAILURE

Possible modes of reservoir failure, the consequences of reservoir failure, and the time rate of failure are considered in this section. The probability that the reservoir might fail is not assessed, although it is expected the probability would be low, based on sound engineering design and quality control. No important differences between the reservoir alternatives were found.

Three failure modes for the reservoir are considered possible:

- Overtopping of the embankment
- A slide through the embankment
- Internal erosion or piping, either through the embankment or through the embankment foundation.

Overtopping of the embankment is not likely because positioning of the embankment on a natural ridge would limit inflow to the reservoir from precipitation and runoff to essentially that which would be directly incident to the reservoir area. In addition, a spillway would prevent the reservoir from rising significantly above the full reservoir level in the event that the pumps supplying the reservoir failed to shut down when the reservoir was full. This same spillway would protect the embankment from overtopping as a result of precipitation and runoff.

If the embankment were to fail by piping, it is expected that wet areas would first appear either on the downstream slope of the dam or near the downstream toe. The rate of increase of flow through the dam would be dependent on the materials with which the dam was constructed and how they were placed in the embankment.

A slope failure, or slide through the embankment, would cause reservoir outflow generally similar to that described for a piping failure. However, there might not be observable phenomena preceding a slope failure. Piping and slope failure would be expected to have comparable consequences.

Failure due either to piping or sliding near the maximum dam section would be the worst case for analysis. Either type of failure might result in a peak discharge approaching 50,000 cfs which would empty the reservoir in a few hours. Since the reservoir embankment would extend around most of the reservoir perimeter, the location of a possible embankment failure would determine the impact area.

That section of the embankment where failure would cause outflow into the Chaco River drainage would be less than 20 feet high, so failure of the embankment in that area would release only a part of the water stored in the reservoir. Since the Chaco River channel near the reservoir is broad, the largest conceivable outflow from the reservoir probably would not cause a flow more than a few feet deep. Further, channel storage and riverbed percolation would act quickly to dissipate the flood wave as it passed down the channel.

If the embankment failed in a section which would cause outflow toward De-na-zin Wash, reservoir release would exceed the capacity of the natural drainage channel. However, for about the first 3 miles downstream, the terrain has a general slope of about 100 feet per mile so overtopping of the channel would have no significant consequences.

About 5 miles below the dam the flow would enter De-na-zin Wash. In this area the wash is broad, with a slope of about 20 feet per mile. It is expected that the peak flow in the wash in that area would not be deeper than 10 feet. The broad channel of De-na-zin Wash would be expected to quickly dissipate the peak flood wave released from the reservoir. There are no significant developments, nor are any expected, in or near the De-na-zin channel and therefore no significant damages nor threats to life would be expected. However, roads and the coal conveyor which cross De-na-zin Wash might be damaged.

SPILLS OR LEAKAGE ASSOCIATED WITH ON-SITE AND OFF-SITE DISPOSAL OF LIQUID AND SOLID WASTES

Various liquids associated with the plant water management system (Project Description Technical Report) could be spilled or leaked into the ground during power plant operation. In addition, spills or leaks could result from the storage or use of such chemicals as sulfuric acid or caustic soda. Spills or leaks may also result from the storage and disposal of plant wastewaters in the evaporation pond and runoff in the coal-pile runoff and storm drainage pond. In general, surface spills from project activities are not expected to reach the downslope environment (De-na-zin Wash) because the coal-pile runoff and storm drainage pond would act as a collector of surface spills upslope in the plant area.

It is expected that the design features of the evaporation ponds and the

coal-pile runoff and storm drainage pond would limit the seepage of stored liquids into underlying zones (refer to the Water Quality Technical Report). To assure that net seepage is low, a leak detection system would be installed as part of the evaporation pond system, while monitoring of existing ground water with monitoring wells could detect leakage away from the coal-pile runoff and storm drainage pond (refer to the section titled Suggested Mitigation).

NO-ACTION ALTERNATIVE

If NMGS were not constructed and operated, the impacts associated with it would not occur. Since it is possible that PNM would have to supply electricity by another means, an analysis of the possible consequences of this alternative was conducted. The level of analysis provides a benchmark against which the consequences of the Proposed Action can be weighed in the public review and decision-making processes.

Further information and references for these discussions of impacts are contained in the Technical Report on Alternatives to the Project.

COAL CONVERSION

A coal-conversion-generation facility, assumed to be located at the proposed Bisti site and to use San Juan Basin coal, would involve converting coal to medium-Btu gas and burning it in a combined-cycle gas turbine/steam turbine, using steam produced from the hot gas-turbine exhaust. Overall, the environmental effects of a coal-conversion-generation facility would be worse than for a conventional coal-fired power plant such as NMGS. The primary environmental concern is the safe disposal of large quantities of solid wastes that would be produced, as well as treatment of liquid waste streams. Water requirements would be similar for both, but a larger construction work force would be needed.

For these environmental reasons, coupled with the fact that a full-scale coal conversion plant has not yet been built, it is likely that such a plant would be more complex than a conventional coal-fired plant with no apparent environmental or cost advantages.

DECENTRALIZED SYSTEM

Since each individual coal-fired power plant in the decentralized system would be smaller than NMGS, the local environmental effects around each plant site would be less than with NMGS, in the absence of unusual local conditions. The combined environmental effects for the whole system with regard to air quality, water use and quality, and solid-waste disposal would be comparable to those for NMGS. Impacts on any one community would be less with a decentralized coal-fired steam electric system. The plants would be smaller and would be built at different time periods or different locations. Work-force-related demands on community infrastructure and services would be reduced, as would revenue benefits to affected jurisdictions. The total electric energy generated would be similar for the two alternatives, but operating experience shows that smaller plants are generally no more efficient, or are less efficient, than larger plants.

Each plant in the decentralized system would require a mode of coal delivery and electric transmission line(s). Depending on the water sources, more than one water supply ROW might be required. The environmental effects of these ROWs would depend on the specific locations of the plants.

GEOTHERMAL PLANT

The major environmental issues in geothermal power production are airborne emissions, solid wastes, brine disposal, subsidence, water use, and hydrologic changes. Other issues include noise, chemical or thermal pollution of surface and ground waters, land and ecosystem disturbance (e.g., erosion, sedimentation), and short-term climatic disturbances. The environmental effects are highly site-dependent.

The airborne emissions of greatest concern are hydrogen sulfide and trace metals. Hydrogen sulfide has an offensive smell and is very toxic at high concentrations. Its release has historically been a problem at geothermal plants.

The management of spent hydrothermal fluids is a key issue, since most are very saline and cannot be discharged into

surface or ground waters. The anticipated disposal scheme is to inject the spent fluids back into the geothermal reservoir, but scaling and plugging are sometimes a problem with very saline fluids. Treatment of the spent fluid would produce large quantities of sludge, which would require careful disposal.

The removal of large quantities of fluid from a geologic formation may result in subsidence, or sinking of the land. Also, the withdrawal and injection of geothermal fluids may increase the rate of microseismic events.

Use of a geothermal reservoir for production of electricity would probably require exogenous sources of water for the heat rejection system. The amounts needed could be similar to that needed for an NMGS-type conventional coal plant.

Social and economic impacts associated with a geothermal plant would be less substantial than those identified for NMGS, because work-force size would be smaller, multiple power plant units would be developed sequentially, with each 50-MW unit requiring a work force of approximately 300 during construction and 100 during operation. The Baca site in New Mexico for geothermal development has met with significant resistance from Native American and environmental groups. Conflicts over water and with Native American lifestyles are the principal reasons for this opposition.

NUCLEAR POWER

Nuclear power plants produce radioactive isotopes (fission products). Some of these may escape into the reactor cooling system because of defects in the cladding material. Also, structural materials, coolant-borne materials, and corrosion products are made radioactive by radiation produced during the fission process. Liquid radioactive wastes are produced from excess reactor coolant, collected drainage, leaky valve stems and pump seals, and so forth. In normal operation, these and other wastes are packaged and disposed of in accordance with safety regulations.

Normal operation of commercial light water reactors results in release of small quantities of short-lived radioactive gases and airborne particulates.

Spent fuel from an operating nuclear reactor is highly radioactive, which poses hazards to public health and safety. Because spent fuel is highly radioactive and its radioactivity presists for a very long time, it requires permanent isolation from the human environment. Current national policy is to develop mined geologic repositories to provide this isolation. This would involve placing the spent fuel in deep, geologically stable rock formations. Substantial evidence has been accumulated over the past 25 years to support the technical feasibility, economic practicality, and safety of such an approach. However, no such repositories are currently in operation.

Currently, spent fuel is being accumulated in on-site storage at commercial power plants across the country. Within the next 5 years, the U.S. Department of Energy estimates that some plants will run out of storage space. Decommissioning of a nuclear power plant must be done in a way that protects public health and safety. The primary ways of decommissioning a facility are (1) "mothballing," which involves removing all fuel and selected radioactive components and placing the facility in protective storage; (2) entombment, which consists of removing all fuel and selected components and sealing the remaining major radioactive components within the shielding structure; and (3) removal/dismantling, which consists of removing from the plant site all fuel and components having radioactivity above predetermined levels.

The construction work force with a nuclear plant would be larger than the anticipated NMGS work force, resulting in higher projected in-migration and greater demand for community infrastructure and services. Operations staff would be smaller. A nuclear facility could increase the projected tax base in affected jurisdictions more than NMGS.

The mining of coal necessary to operate a coal-fired facility usually involves disturbance to a large area of land. Uranium mines, however, are typically underground and disturb a relatively small amount of land.

OUT-OF-STATE POWER SOURCE

Potential out-of-state sources of electricity are likely to be either coal-fired or nuclear power plants. The environmental effects would be similar to those for such plants located in New

Mexico, in the absence of special local conditions. Transmission line ROWs would be longer than those proposed.

An out-of-state power source would displace social and economic impacts from northern San Juan County to other states, if construction of new electrical generating facilities is required.

RENEWABLE RESOURCE ALTERNATIVE

This combination strategy might involve use of the following: conservation, large hydroelectric, central-station solar-thermal electric or photovoltaic, central-station wind, agricultural and forestry wastes, and wood-fired generation. The renewable-resource alternative would disperse social and economic impacts over a wider area because of the smaller scale and greater location options associated with renewable-resource developments. The environmental effects of each of these is discussed below.

The environmental consequences of conservation are minor.

For hydroelectric plants, four environmental issues are likely to require detailed site-specific analyses: (1) the need for upstream and downstream passage of certain species of fish around dams, (2) the effects of water-level fluctuations and downstream flow changes, (3) water quality, and (4) the environmental effects of dredging.

The primary determinants of whether fish passage will be a significant issue at a particular site are the fish species, habitat conditions upstream from the dam, and regulatory requirements. For those fish species whose life cycle includes migration for spawning, blocking migration by a dam can have significant consequences.

Water-level fluctuations resulting from releases required for peak power can adversely affect both reservoir and downstream ecosystems. Potential water quality issues include alteration of temperature regimes, reduced turbidity, changes in dissolved oxygen, increases in certain dissolved metals, and altered nutrient and organic matter regimes. Potential adverse impacts due to dredging include loss of primary production and stress to fish from increased turbidity and destruction of bottom aquatic habitat, and secondary effects on aquatic biota.

Central-station solar-thermal electric or photovoltaic systems would require construction on relatively large areas of land, with potential for land use conflicts and disturbance of local ecosystems.

Environmental issues associated with central-station wind plants include: (1) safety, both public and occupational, during construction and operation; (2) electromagnetic interference, particularly to nearby television receivers; (3) noise; and (4) the aesthetic and land use problems of siting very large towers. Minor issues include bird collisions, ice throwing, lightning danger, and potential aircraft hazards.

Agricultural and forestry wastes might be directly burned or converted to a liquid fuel such as alcohol. The environmental effects of direct burning would be similar to those for wood-fired generation, which is discussed below. Environmental issues associated with biomass-derived alcohol fuel arise from biomass production, conversion to alcohol, and electricity production.

The most significant potential problem related to biomass production is erosion due to removal of wastes that would otherwise help to hold soil in place. Erosion depletes soil fertility and affects air quality, water quality, and ecological communities.

Conversion of biomass to alcohol by biochemical or thermochemical means produces various emissions that may cause environmental problems. Thermochemical process emissions include particulates, nitrogen and carbon oxides, ammonia, and hydrocarbons, as well as oils, phenols, and polynuclear aromatic hydrocarbons. Biochemical processes produce sludges with high biochemical oxygen demand. If applied to the land, these can introduce unconverted organic material, minerals, and inorganic salts into local water supplies and cause a buildup of salts in the soil. However, much of this sludge can be dried and sold as cattle feed.

The environmental, health, and safety issues related to wood-fired generation are not well known. Areas of particular concern are gaseous and particulate pollutants, residue disposal, and safety. Other issues related to harvesting,

transportation, handling, and storage systems include nutrient depletion in forest lands, emissions during wood handling, leachate from wood storage, soil erosion stream sedimentation, impact on ecosystems, land use competition, and occupational accidents in wood harvesting.

Many factors influence the atmospheric emissions from wood burning, but the pollutants of concern include particulates, carbon monoxide, nitrogen oxides, hydrocarbons, polycyclic aromatic hydrocarbons, phenols, aldehydes, potassium, calcium, and aluminum.

ALTERNATIVE USES OF SAN JUAN BASIN COAL

If NMGS is not constructed and operated, the San Juan Basin coal proposed for use would ultimately be used for other purposes. These uses could include export out of the area for use elsewhere or use within the San Juan Basin for another industrial facility. Impacts associated with these possibilities could be similar to those for NMGS, depending on location and type of use.

DELAY-OF-ACTION ALTERNATIVE

A delay of action could result from either an agency permitting delay, applicant-initiated delay or other action. The delay-of-action alternative was analyzed based on the same affected environment as that for the proposed action. The difference in impacts associated with variations in construction schedule would be the socioeconomic effects in the project area.

Delay of construction of units 2, 3, and 4 by 1 year would have a beneficial impact because employment needs on other major projects in northern San Juan County are expected to decrease in 1991, 1992, and 1993. If NMGS work-force needs were higher in those years, worker inmigration would be less, and local unemployment would be reduced.

If construction of units were delayed so that peak NMGS employment demand coincided with higher labor demand expected in the region (e.g., 1987, 1989, 1996, 1997), social and economic impacts would be more adverse. Greater in-migration of new workers to the area would result in increased demand for community facilities and services. Housing, schools, and human services in the affected region would be more strained than expected for the proposed dates.

Delays between construction of NMGS units would generally have an adverse effect on social and economic conditions in the affected region. Unless they are assured of continued local employment opportunities, workers are likely to migrate out of the area as NMGS needs taper off when individual units are completed. This would aggravate fluctuations in local population.

SUGGESTED MITIGATION AND MONITORING PROGRAMS

Mitigation measures were developed based on findings from impact assessment. Some of these were incorporated by the applicant into their Proposed Action project description (Chapter 1). These were assumed to be implemented for the purposes of the analysis since the applicant would be required to incorporate them into the Plan of Operations. The following suggested mitigation measures and monitoring programs were not assumed for the analysis to be implemented, since it is not known at this time whether they would ultimately be required. Identified agencies (or landowners) that would have jurisdiction, expertise, or interest in a specific mitigation measure are listed in parentheses within the suggested mitigation discussions.

NOISE

It is suggested that, where practicable, equipment be designed to minimize noise. Further, plant layout should incorporate noise barriers, such as plant structures themselves and vegetative screening, which also result in minimization of noise (Occupational Safety and Health Administration).

PALEONTOLOGY

Avoidance of those areas where high to moderate sensitivity of paleontological resources have been identified (surface management agency or landowner).

In lieu of avoidance of direct or indirect impacts to the affected resources,

data recovery (i.e., scientifically controlled excavation, analysis, and curation) would provide minimal to adequate mitigation for adverse impacts. Such a recovery program should be developed for areas classified as being of high to moderate paleontological sensitivity within the proposed project areas (Map 3-1).

Major elements of an adequate data recovery mitigation program would include:

- Intensive inventory of proposed project areas preliminarily identified as being of high or moderate paleontological sensitivity to identify any surface-exposed fossils and evaluate their significance.
- Development of a predictive model of significant fossil localities affected by the proposed project to be used as a basis for designing an adequate research strategy and possible construction monitoring program.
- Implementation of a data recovery program. Based on the research strategy, this may involve various levels of recovery intensity (e.g., surface collection, excavation, and collection of units of varying size) keyed to areas of varying predicted distributions of significant fossil remains. This program would include field investigations, laboratory analysis and reporting, and curation.
- Implementation of a construction monitoring and emergency recovery program in areas of predicted occurrence of significant fossil resources. The recovery program could be designed in a manner similar to that followed under nonemergency circumstances.

Mitigative data recovery programs are most effective in offsetting the direct ground-disturbing impacts. Thus they could provide adequate protection of the scientific information value of the fossil materials in areas of high sensitivity. Data recovery in areas of predicted moderate paleontological sensitivity would be most effectively conducted during a construction monitoring and emergency discovery project stage (surface management agency or landowner).

Mitigation of adverse effects caused by indirect impacts of the proposed project is less likely to be adequate. Development of community education projects to enlist local support to protect the fossils in place, complemented by more rigorous enforcement of restrictions on off-road vehicle use in areas of rich paleontological deposits, would provide some protection of scientific values that would otherwise be lost to amateur collectors. Monetary support for an ongoing paleontological research program in the general project area would also offset the losses that might occur through uncon trolled collection or fossil destruction through surface exposure and erosion. A long-range program of project area surface and exposure monitoring and selective data recovery of significant fossils would also provide some resource protection by providing a compensatory data base (New Mexico Institute of Mining Technology, Smithsonian Institution, University of New Mexico, and other universities in the United States).

SOILS

The general types of mitigation measures proposed are:

1. Mulching denuded areas or covering with jute fabric or riprap
2. Topsoiling
3. Drainage control (e.g., waterbars)
4. Reseeding

These measures should be implemented in potential soils reclamation problem areas as detailed in the Soils Technical Report. More detailed descriptions for these mitigation measures are given below, for Vegetation and Range.

BLM reclamation specialists could make an on-the-ground determination of the specific erosion control and reclamation measures to be stipulated. Some disturbed areas (water supply and transmission systems) may not respond adequately to the initial erosion control and reclamation measures that would be implemented following construction. A soils monitoring program should be conducted over the life of the project to identify problem soil erosion/revegetation areas. Once identified, problem soil erosion/revegetation areas would undergo more intensive reclamation and mitigation (e.g., physical stabilization measures and reseeding), thereby helping to ensure that

irreversible and irretrievable commitments of the soils resource would not occur (surface management agency or landowner, U.S. Soil Conservation Service).

HYDROLOGY

WELL-FIELD WATER SUPPLY ALTERNATIVE

Significant impacts due to drawdown in water levels in wells of other ground-water users in the San Juan Structural Basin could be mitigated by replacement of water supply, if required by the New Mexico State Engineer. Such replacement of water could consist of the furnishing of a substitute water supply, the modification of existing water supply facilities such as installation of large pumps, the drilling of replacement wells, the assumption of additional operating costs, or artificial recharge (New Mexico State Engineer).

Impacts due to reduction in the flow of several springs in the Chuska Mountains could occur as a result of the well field for NMGS. However, available information on the hydrology and average discharge of these springs is not sufficient to quantify whether the impacts would be significant. A hydrogeologic reconnaissance of these springs to study their occurrence and relation to the Westwater Canyon Member is recommended as the first part of the monitoring program which would help to quantify the potential impacts. The second part of the recommended monitoring program is to establish stations for gaging the flow data periodically to develop a baseline of average annual discharge of these springs.

Measurable land subsidence probably would occur as a consequence of ground-water withdrawals from the well field. Additional information on the rock properties of the affected aquifer system would be required to attempt to quantify this potential subsidence. It is recommended that a relatively small leveling network in the immediate vicinity of the well field be established to monitor for land subsidence. In addition, if the wells in the NMGS well field are drilled, it is recommended that several representative rock samples be collected and analyzed for properties such as shear strength and compressibility. These data subsequently could be used to evaluate whether or not land subsidence due to ground-water withdrawal would be a significant impact.

WATER DELIVERY SYSTEM/WATER PIPELINES AND INTAKES

The significant impact on one well completed in the alluvium of De-na-zin Wash (well 23.13.14.141), in which a lowering of the water level may occur during construction of the water pipeline crossing, could be mitigated by furnishing a substitute water supply. This form of replacement of the water supply probably is the most practical alternative in this case because the duration of the significant impact would be only about 2 weeks.

Significant short-term impacts due to increase in flood elevation and peak discharge of the San Juan River and decrease in recharge to the alluvial aquifer along the river may occur during construction of the proposed or alternative intake structure and river diversion site. The applicant is planning to analyze hydraulic conditions in the vicinity of the intake structure and river diversion site during final design of this facility. Significant impacts could be mitigated by incorporating certain provisions into the final design of this facility. These provisions would probably be selected after a trial-and-error iterative process that would evaluate how various design features and construction procedures help to minimize adverse changes in flood elevation, peak discharge, and aquifer recharge (New Mexico State Engineer or Army Corps of Engineers).

WATER QUALITY

Mitigation measures that should be implemented to prevent and manage potential spills associated with construction activities include:

- Only the recommended amounts of materials should be used and they should be applied in the recommended manner.
- Good housekeeping procedures such as proper disposal of empty containers, prompt cleanup of accidental spills, neutralization and deactivation of

excess chemicals and wash water should be followed.

- Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped in oils and lubricants should be disposed of in proper receptacles.
- Construction vehicles should be properly maintained to control petroleum leaks.
- Movement of contaminated sediments should be controlled by appropriate sediment control measures such as surface roughening, interception and diversion, vegetative stabilization and non-vegetative stabilization (mulches, netting, chemical binders, and sediment traps and basins).

Mitigation measures that should be implemented to manage the disposal of hydrostatic test water associated with pipeline testing should include the following activities (New Mexico Environmental Improvement Division):

- Whenever possible, hydrostatic test water should be disposed of on land, via evaporation pits or basins, with no surface-water discharge.
- Water should be discharged horizontally into discharge diffuser pipe to minimize flow velocity and prevent potential scour effects.
- If grease and oil are present, water should be routed through one or more straw bale filters, in sequence, to reduce concentrations to acceptable levels.

Because of the potential effects on downstream alluvial aquifers, wastewater discharges, if any, from the plant should be controlled and monitored. The monitoring plan for the effluent discharge should include the following activities (New Mexico Environmental Improvement Division and U.S. Environmental Protection Agency):

- All effluent discharge pipes should be equipped with continuous flow monitoring devices.
- All effluent discharge pipes should be equipped with devices able to continuously monitor for, at least, pH and specific conductance.
- All continuous monitoring devices on the discharge pipes should be connected to the central computer facilities for display, storage, and processing.
- Automated samplers should be used to collect grab samples for composite analysis of effluent discharges.
- Composite samples should be analyzed for the pollutants listed in the NSPS (including total suspended solids, oil and grease, total copper, and total iron). Other chemical parameters that should be measured in the composite samples include TDS, the common ions (calcium, magnesium, sodium, potassium, chloride, sulfate, carbonate, and bicarbonate), phosphorus and nitrogen species, as well as the 129 priority pollutants.
- If discharges occur, water from downstream alluvial wells should be analyzed for the same parameters that were listed in the preceding paragraph.
- A discharge plan describing the quantity and quality of surface-water discharges and of the existing downstream surface-water and hydrogeological environment will be submitted to the NMEID for review and approval before the power plant becomes operational. NMEID approval of the discharge plan would ensure that downgradient ground-water contamination would be minimal.

An operations and procedures manual needs to be prepared to ensure that the evaporation and coal-pile runoff ponds perform as designed. Detailed information regarding all components of the liner systems should be available to the operating personnel. Special monitoring procedures should be developed to assess whether the liner system is operating within the design criteria. Specifically, the quality of collected leachate, if any, and the condition of the liner should be regularly determined and recorded. Embankments and berms should be examined for potential ground movements, cracks, and soil erosion. Plans to control vegetation and rodents should be included in the operations and procedures manual. In addition to these concerns, the unacceptable nature of certain operational practices should be identified. These unacceptable practices include:

- The discharge of high-temperature liquids onto exposed or unprotected liners (liners with no soil cover or with insufficient standing liquid levels)
- The passage of any vehicle over any portion of an exposed liner
- The discharge of incompatible wastes to the liner
- The direct discharge of wastes with high hydraulic energy upon a liner without adequate provision for energy dissipation
- Unauthorized modifications or repairs to the facilities

In addition to monitoring of the actual physical facilities, a monitoring network for downgradient ground waters should be established. This network would include new wells and existing wells. The monitoring system should also include a leak-detection system beneath the evaporation pond so that remedial actions, if necessary, can be taken in a timely manner before downgradient ground water becomes contaminated. Finally, NMEID approval of the discharge plan for the evaporation and coal-pile runoff ponds should ensure that down-gradient contamination would be minimal.

VEGETATION

Areas temporarily cleared of vegetation should be graded to minimize percent slope, and also have soil restored. Contour furrows, traps, and other structures to minimize wind and water erosion, and maximize water collection and infiltration, should be employed (surface management agency or landowner).

After proper seedbed preparation, temporarily disturbed areas where plant root crowns have not remained intact should be replanted. Seed mixtures should contain shrubs, forbs, and native grasses. Seed mixtures should be specialized for a particular precipitation zone, yet be diverse enough to establish cover on the variety of soil types encountered. Both cool- and warm-season grasses should be included.

Revegetated areas should be monitored yearly to assess revegetation success, and replanted if seeds germinate but fail to establish. Seeds may remain viable in the soil for several years if rainfall is not sufficient for germination the first year.

Use buses or vans to transport workers from population centers to and from the job. Reducing the presence of private vehicles will reduce ORV use and consequent destruction of vegetation and erosion.

Baseline and ongoing monitoring studies of soil and water chemistry of high elevation landscapes sensitive to acidification (northeast of project area) should be conducted to measure possible acid rain impacts (U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and New Mexico Environmental Improvement Division).

WILDLIFE AND AQUATIC BIOLOGY

Avoidance of construction in crucial mule deer winter range during the period of December 1 through March 31 is recommended at the proposed (MP 0-2.75) or alternative (MP 0-1.0) intake structure and pipelines (New Mexico Department of Game and Fish, U.S. Fish and Wildlife Service, and BLM).

Avoidance of construction through crucial winter range of elk and mule deer on T4 (MP 65-75; 93-95) between December 1 and March 31.

Avoidance of construction through areas with nesting raptors for the general period of February 1 through June 30. Modification to this period could be made by the BLM Area Manager with site-specific information from raptor specialists. Areas to be avoided should be specified by milepost by the BLM area manager.

Construction of a wildlife water outside the fence that would surround the proposed reservoir. This would provide water to wildlife that would have been denied the use of an area that historically had supplied seasonal water. Because it would be a permanent water source, the wildlife water would also be an enhancement to general wildlife populations (BLM).

Construction of both pipelines simultaneously within the 90-foot right-of-way would eliminate disturbing habitat twice (surface management agency or landowner).

If fishes do not establish in the reservoir, introduce a suitable forage species that could serve as a food source for various water birds that may be attracted to the reservoir. Because no permanent water presently exists, this step would be an enhancement feature.

Use buses or vans to transport workers from the population centers to and from the job to reduce road kills related to increased traffic volume. Use of private vehicles would allow much easier opportunity for increased recreational vehicle use in relatively undisturbed areas. Such activity would likely increase habitat degradation, harrassment of wildlife, and poaching opportunity.

THREATENED AND ENDANGERED SPECIES

Field surveys (100 percent coverage) should be undertaken to identify populations of listed or proposed plant species that may be affected. If these are located in the project area, it is recommended that construction should avoid the specific locations by rerouting, or spanning of transmission lines (surface management agency and U.S. Fish and Wildlife Service).

CULTURAL RESOURCES

In the areas requiring intensive inventory, significant known surface and subsurface resources should be avoided, recorded, or be investigated to recover an adequate sample of their included information prior to construction. The plan would also include some provision for the recovery of previously unknown and significant cultural information discovered during project construction and maintenance, where prudent and feasible, but this would not protect all possible resources in the proposed project area (New Mexico State Historic Preservation Officer and BLM). Specific approaches and further discussion of cultural resources mitigation is detailed in the Cultural Resources Technical Report.

VISUAL RESOURCES

Significant visual consequences have been identified for the NMGS and transmission lines. Various mitigating actions could be taken to reduce or eliminate certain consequences. It is recommended that general mitigating actions should include architectural or design changes to physical structures, resiting components, and landscaping techniques.

NEW MEXICO GENERATING STATION

The primary features of the proposed NMGS that would result in significant visual consequences are the vertical emphasis of plant components (stacks, storage tanks, etc.); the dominant scale and geometric (hard-edge) configuration of the structure, against the predominantly natural and horizontal background landscape; and night lighting. Although the plant would be visible from numerous vistas within a 12-mile radius, the contrasts viewed from the De-na-zin WSA would be the most significant. (Natural topographic relief would mask all but the top third of the stacks visible from the Bisti WSA.) Two techniques could be used to reduce the extent of contrast in form and line (surface management agency or landowner).

An initial mitigation should be to paint the stacks (or specify concrete coloring), storage tanks, boiler and generator housing, and other massive or vertical structures two or more colors, in a banded manner, to blend with the horizontal layering of colors in the natural setting.

The second technique for reducing contrasts would be the design of earthen berms along the site boundary between De-na-zin and the plant. Excess soil and rock removed during the construction phase of the project could be mounded in berms 10-20 feet high that would serve to mask the bottom portion of the plant and thus reduce the extent of visual contrast.

Illumination consequences would be most sensitive during the early fall and late spring months, when visitation to the WSAs is highest. Mitigation measures would include use of FAA-approved strobe lights with ground side shades for stack lights. Facility lights at ground level could be masked from view along the northeastern sides of WSAs by use of landscaped berms between the plant site

and sensitive receptors or use of shading to deflect light toward the plant.

Use of the shortest possible stack heights, while still meeting air quality requirements, would also help reduce impacts.

TRANSMISSION LINES

Mitigation measures for reducing the extent of visual contrast of conductors and towers include using nonreflecting conductors where significant visual contrasts have been identified.

RECREATION

Recreation impacts would be both site-specific and activity-related. Mitigation measures for site-specific impacts focus on physical modifications to the project components. Mitigation for activity-related impacts focuses on augmenting the recreation resource base and improving visitor information sources and supervision of activities. Initial concepts for mitigation of recreation impacts are outlined below.

SITE-SPECIFIC IMPACTS

New Mexico Generating Station

Impacts affecting the Wilderness Study Area recreation experience would include noise and visual intrusions from plant operations and structures at both Bisti and De-na-zin WSAs (BLM).

Visual buffers in the form of earthen berms could be constructed along the northeast edge of the plant site viewed from De-na-zin (only the top third of the stacks will be visible from Bisti). Earthen berms could be constructed from topsoil moved during plant excavation, and should resemble natural formations and contours to blend with existing landscapes (BLM). Large boulders should be incorporated into the design. (Refer to the Visual Resources technical report for specific details and artist's concept.)

Night lighting of the plant should incorporate shaded sides to prevent direct glare noticeable from WSAs.

Transmission System

The primary transmission line impacts would be visual and are addressed under mitigation for visual impacts.

ACTIVITY-RELATED IMPACTS

Sightseeing and Visiting Historic Places

Impacts would include increased visitation to Wilderness Study Areas and Chaco Culture National Historical Park, as well as some of the other resources for this activity in the study region (BLM or National Park Service). Since increased visitation can result in crowded conditions, increased litter, vandalism, and stress on existing facilities, such as sanitation and drinking water, possible mitigation measures would include the following:

- Regulating the number of visitors at any given time period through gate control
- Increasing park supervision
- Expanding facilities and parking areas

The formerly proposed Bisti multiple resource center is an example of one such measure. All of these measures would fall under the purview of the National Park Service or BLM. Since public agencies currently face severe budget cuts and staff reduction, it is unlikely that these measures could be implemented without a method for subsidizing existing budgets. Supplemental funding from PNM could be provided in the form of a lump sum donation toward this mitigation action.

The applicant should provide on-site picnic areas at the plant site for use by employees and visitors. An effort should be made to make these areas aesthetic as well as practical. Landscaping, noise buffers, drinking water, trash facilities, picnic tables, and sun shelters should be provided at each picnic area.

WILDERNESS VALUES

Mitigation suggestions for wilderness consequences include the following:

- Avoidance of WSA boundary crossings by any project components (BLM)
- If designated Wilderness Areas, increased supervision and maintenance of the Bisti and De-na-zin WSAs by BLM and addition of sanitary facilities and waste receptacles at entry points (minimum tools).

- Alternative trails within De-na-zin could be assessed and designed to direct visitors away from areas where vistas of the plant would be most prominent (BLM).

TRANSPORTATION

Require regular maintenance (e.g., blading, repair of culverts and drainage) by PNM for segments 20 and 21 of NM 371, and C-14 and C-15 during construction phase of project.

UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Significant and major environmental impacts that would be unavoidable in the event of implementation of the Proposed Action or any alternatives are presented in Table 3-9. Unavoidable impacts are those impacts expected to occur even after application of the planning and environmental controls incorporated in the Project Description (Chapter 1) and the suggested mitigation measures and monitoring programs described in this chapter. Also included are the resources that would be irreversibly or irretrievably committed. Determination of irreversible or irretrievable commitment of resources assumes the same environmental controls and mitigation used in the analyses for unavoidable impacts.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The relationship of the Proposed Action and alternatives to the goals of NEPA is expressed in terms of a NEPA objective to maintain and enhance the long-term productivity of the environment. The evaluation of the short-term use of the environment, through implementation of the Proposed Action, was made with respect to current longer-term environmental trends within the affected environment.

Several short-term uses could create an environmental tradeoff situation with respect to long-term productivity. The main such tradeoff involves the well-field water supply alternative. The well field water supply alternative could affect ground-water levels in three aquifers for more than 100 years. This would affect the future beneficial use of these aquifers in the San Juan Basin. At the same time, generation of electric power would provide for a wide range of beneficial uses and increased productivity. The economies in the area of the project would be enhanced, and a high standard of living for a wide range of electric users would be promoted by transmitting electric power to baseload centers.

Other project-related impacts would foreclose fewer future alternative resource allocation options. Coal and other raw materials would be utilized as described. The value of the wilderness perience and opportunities for solitude in the project area would be reduced. Some cultural and paleontological resources would be recovered for scientific investigation, while others would be permanently lost and unavailable for future investigation. Project-associated population influx to the greater Farmington area would hasten the area's trend away from an independent, rural-oriented lifestyle to a more urbanized center of trade with its attendant congestion and human interdependencies.

Table 3-9. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Resource	Unavoidable Adverse Impacts	Commitment of Resources: Irreversible	Commitment of Resources: Irretrievable
New Mexico Generating Station			
Air Quality	Air quality degraded by emission of the following pollutants (tons/day): TSP, 8; SO_2, 89; NO_x, 118; CO, 16.	No	No
	From Chaco Culture National Historical Park, perceptible plume discoloration is predicted to occur approximately 36-37 mornings and 5-6 afternoons per year, with maximum occurrence during winter. Highly perceptible plume discoloration is predicted to occur about 1-2 mornings per year.	No	No
Minerals	A total of 300 million tons of coal mined in the San Juan Basin and consumed.	Yes	Yes
Paleontology	Adverse impacts to some paleontological resources which could be damaged or destroyed.	Yes	Yes
Soils	Accelerated erosion due to wind and water resulting in decreased soil stability, and decreased soil fertility and productivity.	No	Yes
Wildlife	Increased hunting and fishing pressure would result in an average of 15,500 additional fish harvested per year through the year 2000 and 45 additional mule deer harvested per year through the year 2000. This represents an increase of approximately 2 percent over baseline harvest figures.	No	No

Table 3-9. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES (continued)

Resource	Unavoidable Adverse Impacts	Commitment of Resources: Irreversible	Commitment of Resources: Irretrievable
Cultural	Adverse impacts to some cultural resources which could be permanently lost and unavailable for future investigation.	Yes	Yes
Visual	The NMGS facility would exceed contrast ratings established for BLM class requirements.	No	No
Recreation	Increased use of the recreation base would result in significant increases in overcrowding, litter, fire, and uncontrolled ORV use. For those impacts which cannot be adequately supervised, adverse and unavoidable impacts would result.	No	No
Wilderness	The scenic character viewed from the Bisti and De-na-zin WSAs would be impaired, thereby adversely affecting the wilderness experience. Increased visitor use would result in impacts similar to those discussed for recreation resources.	No	No
Transportation	Significant delays and safety problems would result for those transportation routes that cannot accommodate projected traffic and for which no improvements are planned or implemented.	No	No
Social and Economic Conditions	Significant impacts could occur if projected housing demand exceeds availability.	No	No
	Significant impacts could occur to the quality and/or quantity of services available through human service agencies.	No	No

Table 3-9. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES (continued)

Resource	Unavoidable Adverse Impacts	Commitment of Resources: Irreversible	Commitment of Resources: Irretrievable
	Significant impacts could occur to traditional Navajo values and lifestyles. Some opportunities to pursue a traditional lifestyle could be lost.	Yes	Yes
Water Supply System			
Paleontology	Adverse impacts to some paleontological resources in highly sensitive zones for water pipelines P1, P2, and P3.	Yes	Yes
Soils	Accelerated erosion due to wind and water resulting in decreased soil stability, and decreased soil fertility and productivity.	No	Yes
Hydrology	Surface Water		
	Consumptive use of 20,000 or 35,000 ac-ft/yr of San Juan River water for NMGS.	No	Yes
	Reduction of 28 or 48 cfs in the average San Juan River streamflow below the proposed or alternative intake sites, depending on the alternative.	No	Yes
	Ground Water		
	Consumptive use of 15,000 ac-ft/yr of ground water; significant drawdowns in three aquifers; unknown reduction in flow from springs in the Chuska Mountains; decrease in natural ground-water discharge to local streams.	Yes	Yes
	Measurable land subsidence near the well field.	Yes	Yes

Table 3-9. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES (concluded)

Resource	Unavoidable Adverse Impacts	Commitment of Resources	
		Irreversible	Irretrievable
Wildlife	Water pipelines P1, P2, and P3 would disturb mule deer crucial winter range.	No	No
Cultural	Adverse impacts to some cultural resources on P1, P2, and P3 which could be permanently lost and unavailable for future investigation.	Yes	Yes
<u>Transmission System</u>			
Paleontology	Adverse impacts to some paleontological resources in highly sensitive zones for transmission lines T1, T4, and T5.	Yes	Yes
Soils	Accelerated erosion due to wind and water resulting in decreased soil stability, and decreased soil fertility and productivity.	No	Yes
Wildlife	Transmission line T4 would disturb mule deer and elk crucial winter range.	No	No
Cultural	Adverse impacts to some cultural resources on T1, T2, T3, T4, and T5 which could be lost and unavailable for future investigation.	Yes	Yes
Visual	Portions of transmission lines T1, T2, T3, and T4 would exceed contrast ratings established for BLM class requirements.	No	No
Wilderness	The scenic character viewed from the Cabezon WSA would be impaired by transmission line T2, thereby adversely affecting the wilderness experience.	No	No

POSSIBLE NEW TOWN

Chapter I

PURPOSE, NEED, AND PROJECT DESCRIPTION

Paragon Resources, Inc., a subsidiary of PNM, has proposed to exchange 17,138 acres of private land (Ute Mountain Lands) in Taos County, New Mexico, for approximately 8400 acres of public lands near Bisti, New Mexico (Bisti Lands). This exchange was the subject of a recent Environmental Assessment (EA) (BLM 1981), as part of BLM's San Juan Basin Action Plan (SJBAP). A parcel of the Bisti Lands (see Map 1-1 in NMGS Chapter 1 and the Appendix G maps) has been mentioned by Paragon as the possible future site of a new town. The possible new town is not a part of the NMGS Proposed Action. It is the subject of environmental analysis in this document because it is a possible end use of the Ute Mountain Land Exchange.

Discussions on the proposed land exchange have been in progress since 1974. The history and background of this proposal are summarized in the Ute Mountain Land Exchange EA, available for public inspection at the BLM offices in Albuquerque, Farmington, Santa Fe, and Taos. A BLM decision on the proposed exchange has not yet been made.

PURPOSE AND NEED

The purpose of the possible new town would be to accommodate a labor force and families in closer proximity to planned and possible future industrial development than the greater Farmington area.

The need for the possible new town has not been established at this time.

OVERVIEW AND GENERAL PROJECT DESCRIPTION

Since the feasibility of the project is not established, a detailed description of a possible new town is not available. If ROW applications in support of a new town are submitted, a detailed project description would be required in order to assess site-specific and cumulative effects in accordance with National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations. In the description below, a general outline and range of projections for a new town development are presented in order to provide a general discussion of impacts.

The possible new town site would be located in township 24 north, range 11 west; sections south half of 21; southwest quarters of 22, 27, 28; north half of 33; north half of 34. The new town would occupy approximately 2400 acres, with a controlled and undeveloped area surrounding the site. Access to the new town would be from existing roads.

PROJECTED SIZE OF A NEW TOWN

Paragon's feasibility studies examined a new town that would have the potential for serving between 8000 and 20,000 inhabitants (peaks due to temporary construction workers could exceed 20,000), with a more likely long-term population in the range of approximately 10,000 to 12,000. The ultimate size of the new town and the time frame in which it may be developed would be highly dependent upon the development of various energy projects in the area, including coal mines, coal gasification and liquefaction, power plants, and other oil and gas development. If a new town becomes feasible, initial development could begin in the mid-1980s.

NEW TOWN MANAGEMENT

A subsidiary of PNM, such as Paragon, would provide management services to a new town, either on contract or directly. These services would be those normally provided by city management under the direction of a city council. In the event that the new town eventually became incorporated under the provisions of New Mexico statutes, such city services and city management activities would be transferred to the control of the city government.

UTILITIES AND OTHER SERVICES

Electric Service

Electric power would be provided to the new town inhabitants through a municipal distribution system. Power would be supplied in bulk through a 115-kilovolt (kV) tap from PNM's proposed Fruitland 230-kV transmission line. The tap would originate at a new substation (proposed as part of the Fruitland 230-kV project), to be located about 1 mile south of the proposed NMGS site. A 50-foot ROW would be needed from the proposed substation to the boundary of the new town site. No specific ROW has been designated. Although other alternatives may exist, one alternative that would be considered is a route paralleling County Road 15, which would connect the new town site to the NMGS site, a distance of approximately 12 miles.

Water and Sewer

Water and sewer services would be provided by a municipal utility system organized and managed by the new town sponsor. Water would be purchased on a bulk supply contract from a PNM subsidiary, such as Paragon, at the new town site. The subsidiary would assume responsibility for treatment and distribution of water to new town inhabitants.

Ground water from deep aquifers beneath the site area would be a potential water source. The annual projected use during a peak year (20,000 residents) is estimated at 4550 acre-feet per year (ac-ft/yr) (200 gallons per person per day). Paragon currently has pending with the New Mexico State Engineer an application to acquire ground water from the Westwater Canyon Member of the Morrison Formation in the San Juan Basin. Assuming approval of the application, a portion of this water could be used to supply new town residents. The Morrison Formation is approximately 5000 feet below the land surface at the new town site. The source of water for the town is assumed to be a well tapping a deep aquifer, such as the Westwater Canyon Member of the Morrison Formation. The water system would be financed by hookup charges, service charges based on consumption, and on direct subsidies as may be appropriate to the development of the new town.

Sewage treatment and disposal for the new town would consist of an extended aeration package plant involving four primary treatment steps: (1) screening, (2) aeration, (3) settling, with sludge returned to the aeration section, and (4) effluent chlorination. The sewage treatment plant would be located on the new town site. Sludge solids would be landfilled or applied to public parks or greenbelt areas as fertilizer and soil conditioner. As with the water system, appropriate user fees and subsidies would be used to finance construction and operation.

Solid Waste Disposal

Solid wastes would be collected and used as landfill. A landfill would be established on the new town site and operated according to applicable county and state ordinances. The Institute of Solid Wastes estimates the required landfill space for an average community is 1.25 ac-ft/yr per 1000 residents. Using this average figure, the estimated landfill requirements for the new town at peak (long-term) population (20,000 residents) would be 25 ac-ft/yr.

Fire, Police, and Schools

Fire and police protection would be provided through a cooperative agreement with the county. Such services are normally provided by the county to an unincorporated community. However, dependent upon agreements reached with the county to ensure adequate fire and police protection, the new town sponsor may elect to supplement county services or to directly provide such services as fire and police protection. Financing for fire and police protection, whether provided

through subsidy or through agreement with the county, must be arranged as the new town becomes established and grows. Schools would be provided for new town residents in cooperation with the county and local school districts. This could include financing the construction of schools, with eventual transfer of the schools to county jurisdiction, or it may include creating a new school district. Such schools would be constructed and provided for in accordance with state law.

Other Services and Commercial Enterprises

Medical services would be provided to initial new town residents through subsidies by the new town sponsor. Then, as the new town community grows in size and demand for a permanent medical clinic increases, Paragon would provide the capital investment requirements and attract interested physicians. The clinic, once fully operational, would operate as a private enterprise.

Other services would be provided as needed. Commercial enterprises, such as grocery and drug stores, clothing stores, service stations, and a possible bottled-gas supplier (because of the lack of available natural gas in the area) would be developed through agreements with private individuals and/or companies by the new town sponsor (using incentives, if required).

Chapter II

AFFECTED ENVIRONMENT

This chapter describes the resource components of the environment that could be affected by the potential development of a new town. These resources include climate and air quality; geologic setting (including geologic hazards); mineral resources; paleontological resources; soils and prime and unique farmlands; water resources; vegetation and range; wildlife; threatened and endangered species; cultural resources; visual resources; recreation resources; wilderness values; transportation networks; social and economic conditions; and land use controls and constraints.

For the purposes of this EIS, descriptions of resources are summarized and the level of detail provided is limited to that necessary for the general discussion of projected impacts in Chapter III.

AIR QUALITY

Because of a lack of industrial development in the region surrounding the proposed new town site, air quality is generally considered good. Air quality measurements of nitrogen dioxide, sulfur dioxide, and total suspended particulates, as well as meteorological conditions, wind speed, wind direction, precipitation, and solar insolation, made at the proposed NMGS site 12 miles to the southwest are considered representative for the new town site. Pollutant concentrations measured at the NMGS monitor were low, and were often measured at the threshold limit of detection for the recording instruments.

NOISE

Noise levels in the vicinity are represented by the levels measured in the De-na-zin WSA. These values are in the range of 32 to 35 dB(A), and are representative of secluded areas.

GEOLOGIC SETTING (Including Geologic Hazards)

The area in which a new town would be located lies on the upper part of the Naashoibito Member of the Kirtland Formation and the lower part of the Ojo Alamo Sandstone. The entire area is covered by a thin layer of surficial Quaternary alluvium (underlain to a large extent by bedrock). Topography is flat to gently rolling, with ridges and badlands on the northern half of the new town site. No potential geologic or seismic hazards are known in the area.

MINERAL RESOURCES

Potential oil or gas fields are the only commercial mineral resources that are expected to occur in the area of the new town site.

PALEONTOLOGICAL RESOURCES

The possible new town site would be located in the middle of a region that has been known for more than 120 years to contain rich deposits of highly important paleontological resources. Aspects of the paleontology of this region, e.g., in the Bisti Badlands and Fossil Forest, are currently the subject of intensive research by professional paleontologists from across the United States. Extensive exposures of fossiliferous bedrock within a 15-mile radius of the new town site are among the richest in the entire San Juan Basin. This is especially true for Cretaceous and Paleocene continental deposits. Most research has centered on these exposures, and a large amount of

literature now exists on the paleontology of this area.

The possible new town site lies on the upper part of the Naashoibito Member of the Kirtland Formation and the lower part of the Ojo Alamo Sandstone. There is virtually no bedrock exposure within the site boundaries, the entire area being covered by a thin layer of surficial Quaternary alluvium. Petrified wood, including large sections of logs and abundant small fragments, are found over much of the site. This material appears to have been derived as a lag deposit during the development of the present soil profile and alluvial cover. None of this material constitutes a significant paleontological resource, although it suggests the possibility that significant plant fossils might be encountered during bedrock disturbances in the possible new town site.

There are no previous reports of fossils from the possible new town site, but occurrences reported from adjacent areas (Kues et al. 1977; Rowe and Sundberg 1980) indicate a strong probability that significant vertebrate fossils occur in the immediately subsurface bedrock of this area. BLM, University of Arizona, University of California, and Museum of Northern Arizona locality archives record numerous localities in nearby stratigraphically equivalent areas. Numerous significant specimens have been recovered from these localities. The distribution of fossils in adjacent areas projects an estimate of 10 significant paleontological occurrences per square mile of bedrock at the possible new town site.

SOILS, PRIME AND UNIQUE FARMLANDS

Soils

The possible new town site is within the San Juan River Valley Mesas and Plateaus portion of the Western Range and Irrigated Region (SCS 1978a). Two different soil associations were identified at the site: Sheppard-Huerfano-Notal and Shiprock-Sheppard-Doak (SCS 1979).

The soils identified at the new town site are primarily deep. The dominant surface textures of the soils identified at the site are loamy fine sand, sandy clay loam, silty clay loam, fine sandy loam, and loam. These soils are well to somewhat excessively drained. The identified soils are forming in eolian, alluvial, and residual materials derived primarily from sandstone, shale, and silt stone. These soils are forming primarily on gently to strongly sloping mesas, plateaus, intermittent drainageways, terraces, and fans. Topsoil availability at the possible new town site is good, but the topsoil quality is primarily fair to poor. Susceptibility of these soils to wind-induced erosion is moderate to high, and susceptibility to water-induced soil erosion is low to moderate. The identified soils are mildly to strongly alkaline, and shrink-swell potential ranges from low to high. These soils currently support vegetation that is used primarily for livestock grazing and wildlife habitat.

Prime and Unique Farmlands

The soil types present at the new town site do not qualify as Prime Agricultural Land (SCS 1978b, 1980); nor does the site have any Unique or Statewide/Locally Important Farmland. Therefore, further analysis was not conducted.

HYDROLOGY

There are no known surface-water impoundments, wells, or springs at or in the immediate vicinity of the new town site (USGS 1981a; Link and Kelly 1980). Alluvium in the unnamed wash most likely contains minor amounts of shallow ground water. The depth to other water-bearing units at the site (e.g., sandstone beds in the Fruitland Formation or Pictured Cliffs Sandstone) is on the order of 100 feet or more. The expected yields of wells that tap these units probably would be sufficient for stock or domestic uses. The depth to the Westwater Canyon Member of the Morrison Formation, the most extensive regional aquifer in the San Juan Basin, is approximately 5500 feet.

WATER QUALITY

The new town site would be located in the drainage basin of De-na-zin Wash. The quality of water in these intermittent streams is likely to be similar to that found in De-na-zin tributaries near the proposed NMGS plant site. Levels of total dissolved solids (TDS) probably range from less than 500 milligrams per

liter (mg/l) to over 2000 mg/l; suspended solids concentrations are expected to be high. Total metal concentrations are high, with most of the metals being associated with particulate matter. The quality of ground water found in sandstone beds in the Fruitland Formation or Pictured Cliffs Sandstone is also expected to be similar to that found near the proposed NMGS plant site. Chemical analyses of wells tapping the Westwater Canyon Member indicate that water from these wells could be characterized as sodium sulfate types, with varying concentrations of calcium, bicarbonate, and chloride. The water from this aquifer would generally not be suitable, without treatment, for municipal water supply or irrigation uses. A review of available standards and criteria suggests that these waters could be used for stock watering.

VEGETATION

Three regional vegetation types and four subtypes are present on the new town site. The three regional types (and subtypes within the broader regional types) are: (1) shrubland-grassland regional type (subtype big sagebrush-blue gramma-galleta grass, 1850 acres); (2) juniper savannas and pinyon-juniper woodland regional types (subtype juniper, 399 acres); and (3) sand wash and saline lowland regional type ([subtype sand wash, 34 acres] [subtype greasewood-galleta-alkali sacaton, 117 acres]).

WILDLIFE

There are no deer, elk, pronghorn antelope, or any other big game in the area where the new town site would be located. Typical small and medium-sized mammals that would be associated with vegetation present on the site include the black-tailed jackrabbit, white-tailed antelope squirrel, silky pocket mouse, plains pocket mouse, northern grasshopper mouse, and coyote.

Game birds are not abundant on the site, although both scaled quail and mourning dove occur. Two raptor nests (Swainson's hawk and long-eared owl) are reported within 5 miles of the new town site.

Because of a lack of permanent aquatic habitat on the site, waterfowl or aquatic species are either not present or occur infrequently and seasonally.

THREATENED AND ENDANGERED SPECIES

The following federally listed or proposed threatened or endangered species have range or potential habitat that occurs in the vicinity of the possible new town site.

- Black-footed ferret (Mustela nigripes), endangered
- Bald eagle (Haliaeetus leucocephalus), endangered
- Peregrine falcon (Falco peregrinus anatum), endangered
- Mesa Verde cactus (Sclerocactus mesae verdae), threatened

No prairie dog colonies are present on the new town site or within a 5-mile buffer zone. No suitable nesting habitat for bald eagles or peregrine falcons exists on the new town site or within a 5-mile buffer. Occurrence of either species would therefore be as occasional migrants.

No suitable habitat for the Mesa Verde cactus exists within the new town boundaries. However, the species has been reported immediately west of the proposed NMGS site, and heavy clay and gravelly soils in the De-na-zin WSA immediately north of the new town site are potential habitat.

CULTURAL RESOURCES

The San Juan Basin has been inhabited for at least the past 11,000 years and retains a complex record of that human occupation. Archaeologically, the area is best known for its record of the culture of the Chacoans, a prehistoric Anasazi people who lived in the region from AD 500 to AD 1300. However, it also holds significant remains of earlier Paleo-Indian and Archaic cultures and later Navajo history. It is the traditional as well as present home of several Native American peoples, especially the Navajo, but also the Ute to the north, the Jicarilla Apache to the east, and the Puebloans to the south and southeast.

Finally, it has a sparse but significant record of historic Euroamerican habitation of the area. Archaeological and ethnological studies of prehistoric and modern cultural resources have been conducted in this area for a century, providing an understanding of the significance of those resources. At the same time, the complexity of this cultural resource base is such that only a small portion of it is presently described in sufficient detail for making specific management decisions.

Archaeological site densities can be estimated from Class III archaeological survey data for the south-central San Juan Basin. Assuming the new town site would represent an average area in the San Juan Basin, the total number of sites expected would range from 32 (for a low average density) to 61 (for a high average density).

VISUAL RESOURCES

The landscapes in the general vicinity where a new town would be located are desert open space, with no distinctive landform features. Little color variation exists, and there is little change in texture or form. The surrounding landscapes are occupied by grassland and sagebrush vegetation. Aside from NM 371 and NM 44, only secondary unimproved roads lead to the general vicinity from Farmington. The visual quality rating for the landscapes surrounding the new town site is Class C; they have a Visual Resource Management (VRM) Class IV rating.

RECREATION RESOURCES

The public lands in the San Juan Basin are characterized by open expanses of semiarid country surrounded on the fringes by forested mountains. Because the general region is semiarid, surface water attracts many people for recreation activities. Mountains that surround the general region are also suited to many recreation activities. The general study region has not been an area of high recreation use, for several reasons. A relatively small area population, poor roads, general lack of surface water, few publicized recreation attractions, prohibitive land ownership patterns, lack of tourist services, and poor access to gasoline have discouraged utilization of the area's recreation potential.

WILDERNESS VALUES

The De-na-zin WSA is located within one-half mile of the northwestern corner of the site that would be considered for the possible new town. This WSA occupies 19,000 acres of badlands formations that possess outstanding scenic qualities as well as valued paleontological resources. The area exhibits rich colors, forms, and texture variation, ranging from light bleached sands to mounds having black and purple soil colors. The natural formations, the presence of petrified logs and fossils, and the expansiveness of the untouched area all combine to make the De-na-zin WSA highly valued for scenic, educational, and recreation purposes.

The De-na-zin WSA has a visual quality rating of Class A, high visual sensitivity, and is in a VRM Class II area.

TRANSPORTATION

The new town site would be located along San Juan County Road 15 (unimproved) approximately midway between NM 371 to the west and NM 44 to the east (see Map 2-5 in NMGS Chapter 2). Current traffic on these narrow graded dirt roads is estimated to be fewer than 20 vehicles a day. There are no ditches or culverts for roadway drainage, making the roads nearly impassable during inclement weather.

Safety is one of the primary deficiencies of highways and roads in the San Juan-McKinley County network. Other regional considerations are discussed in NMGS Chapter 2.

SOCIAL AND ECONOMIC CONDITIONS

The possible new town site is currently uninhabited and supports domestic livestock grazing and wildlife. The nearest communities are Farmington, Aztec, Bloomfield, and other unincorporated communities in northern San Juan County and in Crownpoint and Thoreau in McKinley County. Regional social and economic conditions are described in NMGS Chapter 2.

LAND USE CONTROLS AND CONSTRAINTS

The possible new town site is in an area that is currently classified as public lands under the management of the BLM. As required by the Federal Land Policy and Management Act of 1976 (FLPMA), BLM has prepared comprehensive Management Framework Plans (MFP) for various planning units in the area. The MFP for the Chaco and San Juan Planning Units (updated 1981) covers the area of the possible new town site. A relevant major recommendation in this MFP is the following:

- Make BLM public lands available for the Ute Mountain Exchange. (In effect, this could transfer the surface ownership of the land for a new town from public to private [PNM] ownership.)

Chapter III

ENVIRONMENTAL CONSEQUENCES

This chapter discusses the environmental consequences that could result from development of a new town. Impacts are addressed for each of the resource topics described in Chapter II. In the impact analysis, broad categories and general types of impacts that could be expected are discussed. Those categories of impacts with the most potential to result in significant impacts are emphasized. In general, quantification of anticipated impacts is not presented and would not be possible until a new town is proposed and specific development plans are available.

AIR QUALITY

Air quality impacts that would result from a new town would include pollutant emissions associated with vehicles and residential home heating. Assuming an initial population of 2000, with 2000 vehicles, the estimated annual increase in local vehicular traffic is estimated to be approximately 29 million vehicle-miles. Annual emissions due to increased vehicle travel were estimated from available EPA (1979) emission factors and are as follows (in tons per year): total suspended particulates, 19; sulfur dioxide, 17; nitrogen oxides, 260; hydrocarbons, 151; carbon monoxide, 960. These emissions would be spread over the length of the local roadways, and no significant impacts are expected.

If county roadways in the vicinity of a new town would be paved, it is expected that emissions of particulate matter due to traffic on paved roads would be small and would have an insignificant impact on air quality in the project region. If they are not paved, then suspended particulates would result from traffic use to a level dependent on roadbed engineering and maintenance.

Residential Emissions

Emissions and impacts on air quality would result from construction and activities associated with increased population in the area. The primary pollutant would be particulates, although some gaseous pollutants such as nitrogen oxides, sulfur dioxide, and carbon monoxide would be emitted from the numerous combustion activities associated with home heating and internal combustion engines. Provided the new town would be a residential center with no additional industry, any impacts of gaseous pollutants associated with the new town would be minimal, since they would be relatively small and spread out over a large area.

NOISE

Noise impacts associated with the possible new town would result primarily from resident-related automobile traffic. Noise levels on a road such as C-15 are dependent on the number of vehicles in a given time period. It is not known to what degree this road would be used; assuming a rate of 100 vehicles per hour, noise levels at 50 feet from the road would be in the range of 60 to 65 dB(A). A rate of 500 vehicles per hour would be likely to produce noise levels of 65 to 70 dB(A) at 50 feet from the road. At 2000 feet from the road, noise levels would attenuate to ambient levels.

Automobile use within the new town itself would obviously contribute to noise levels along roads and near residences. It is not possible to provide an accurate estimation of vehicle use in the town or a precise approximation of noise levels. However, it is reasonable to assume that during the most active portion of a day, noise levels would be in the range of 50 to 65 dB(A) within the town, dependent

on the location and the level of automobile or other noise-related activity at such location.

GEOLOGIC SETTING (Including Geologic Hazards)

No impacts to unique or scientifically important geologic formations would be expected. No potential geologic or seismic hazards would be expected.

MINERAL RESOURCES

Drilling of potential oil or gas fields would not be prevented or restricted by construction of a new town. Any potential wells would be expected to be widely spaced and would not conflict with a new town development.

PALEONTOLOGICAL RESOURCES

The proposed development of a new town would be expected to result in direct impacts to significant paleontological resources within the site boundaries. These would be primarily from bedrock disturbances during construction. Since the entire site is covered by alluvium, it is not possible to predict the exact locations of the fossils expected to exist in the underlying bedrock. However, based on comparative data, the new town site is classified as being of high paleontological sensitivity.

Because the development of a new town would be accompanied by a large influx of permanent residents to the area, the potential indirect adverse impacts of this possible population influx on the paleontological resource could be significant. In general, the scientific values of fossil beds close to population centers suffer badly from fossil collecting by amateurs or "rockhounds." Miller, Tidwell, and Petersen (1979) discuss this problem as it applies specifically to the exposures surrounding the study area and present photographs of fossils used in residential landscaping. The delicate nature of most fossils requires difficult and specialized collecting techniques that are rarely employed by nonprofessionals, generally causing severe damage to the fossils and their depositional environments. Nonprofessional fossil collection could be expected to occur along washes and drainage exposures in the area.

SOILS, PRIME AND UNIQUE FARMLANDS

Soils

Construction of the new town would disturb approximately 2400 acres of soils and topography. The entire new town site would probably be permanently changed from its preconstruction use (grazing and wildlife habitat) to an urban development. Expected types and causes of soils impacts and potential reclamation problems, such as water or wind erosion and removal of topsoil, would be similar to those discussed for NMGS.

Construction of utilities (e.g., water, gas, electric power) necessary for the new town would disturb an unknown amount of soils and topography. An unknown amount of additional land in the vicinity of the new town could be adversely affected (e.g., accelerated erosion, compaction, and reduced productivity) by recreational pursuits (e.g., ORV use) of new town residents.

Prime and Unique Farmlands

Construction of the possible new town would not affect any Prime, Unique, or Statewide/Locally Important Farmland.

HYDROLOGY

If any facilities for the new town were built in the floodplain of the unnamed wash that crosses the site, impacts due to increased flooding might result. The new town development itself may increase downstream flows due to reduced infiltration because of the increase in impervious surfaces. It is assumed that a well tapping a deep aquifer, such as the Westwater Canyon Member of the Morrison Formation, would be drilled at the new town site to provide a supply of water for construction and municipal uses. Such use of ground water may cause drawdown of the water levels, which could affect other wells that also tap that aquifer.

WATER QUALITY

Construction and operation of the new town could affect both surface- and

ground-water quality. Sediment loss during construction could increase the level of suspended solids and turbidity in downstream waters. Potential increases in those parameters would not be expected to be noticeable because of the already high existing levels of suspended solids and turbidity in these ephemeral streams when flow occurs. Spills of solvents, detergents, other construction-related fluids, and concrete would be expected to degrade surface soils but would not be expected to affect usable ground-water supplies.

Disposal of municipal solid waste produced by the new town could degrade ground-water quality. However, because of the absence of surface waters in the area, only ground-water aquifers in the immediate area of the landfill site could be affected. Urban runoff could contribute suspended solids, nutrients, trace metals, and pesticides to downstream areas. Disposal of treated municipal sewage could affect downstream surface- and ground-water quality, depending on the treatment or disposal option chosen. For example, surface-water discharge of treated effluent could (depending on the level of treatment) increase the levels of nutrients, pathogenic organisms, and refractory organics in downstream surface and ground waters. If an option such as evaporation/percolation ponds were chosen, ground water in the immediate area of the ponds and downgradient of the percolation ponds could be affected.

VEGETATION

Direct effects of construction would include removal of or damage to approximately 2400 acres of vegetation and increased erosion rates. Removal of or damage to existing vegetation would not be considered significant because the vegetation types removed or damaged are common throughout the San Juan Basin and therefore do not constitute a unique resource. Construction activities that would remove vegetation from large areas of soil would also result in increased water and wind erosion in affected areas. Erosion impacts of the possible new town should be compared against the relatively high background rate of natural soil movement in this area.

Indirect impacts would include physical damage to vegetation and soils from ORV use and foot traffic. Impacts would occur in areas with jeep trails and denuded slopes and banks. Typically, vegetation would be removed or greatly degraded in small, isolated areas by such use, rather than a general, extensive decline in condition. A second possible indirect impact would be the creation of small wetland areas along previously intermittent drainages made perennial by municipal water discharge. A third potential indirect impact would be the harvest of particular plant species for human use, particularly firewood. Juniper is the only tree for many miles. Adult trees could be locally eliminated by firewood collectors.

WILDLIFE

Approximately 2400 acres of wildlife habitat would be permanently disturbed or removed if a new town were built. The majority of small mammals, birds, and reptiles would probably be either destroyed or displaced. Species that would be likely to recolonize (e.g., mice, coyote, jackrabbits, passerine birds) would be those tolerant of human activity and habitat disturbance. The resultant species composition would probably be lower in diversity and density.

The permanent presence of humans in the area would probably result in an increase in road kills, poaching, and general harassment. Animals would probably become more wary of humans and may move some distance away from the settlement.

Since there is no aquatic habitat present or close to the possible new town site, there would be no impacts to any aquatic habitat.

THREATENED AND ENDANGERED SPECIES

If Mesa Verde cactus is present on the possible new town site, or in areas that may be affected because of increased recreational use or ORV activities, potential impacts could include:

- Direct destruction of populations or individuals
- Accelerated erosion in areas supporting the species

- Removal of local populations by cactus collectors

CULTURAL RESOURCES

A new town development would probably cause total surface disturbance in areas of residential structures, stores, parking lots, installation of utilities, schools, firehouses, community centers, water wells, access roads, and so forth. Also, if a large work force were stationed in a remote portion of the San Juan Basin, indirect impacts to archaeological sites, such as the Pierre site, a Chacoan outlier, would result from the marked increased population engaging in evening and weekend recreation activities. Indirect impacts could include damage caused by alteration of vegetation, leading to increased erosion, and increased pot hunting and collection of other surface materials as a recreational activity. Direct and indirect impacts cannot be quantified or their significance evaluated until more specific information about the size, boundaries, and proposed period of occupation of a new town facility is projected.

VISUAL RESOURCES

Two general types of visual consequence would result: (1) direct changes to the visual character of the natural setting from the introduction of physical structures (homes and service buildings), utility lines, streets, water and sewage systems, and other ancillary facilities; and (2) indirect changes to the surrounding landscapes from the activities of resident populations (such as litter, vandalism, visual scars from unauthorized use of ORVs, reduced visibility as a result of emissions from autos and wood-burning stoves).

The access provided by the two major roads (NM 371 and County Road 15 via NM 44) to the possible town site, and the proximity to the Bisti and De-na-zin WSAs, could increase sensitivity in this remote area over future years. Since views are expansive from the elevated portions of the WSAs and roadways, the unnatural form, line, colors, and texture of a human development such as a new town would present a visual intrusion in the open and gently rolling natural landscapes that compose the background scenery viewed from these areas. Visual consequences would be particularly noticeable to WSA visitors, whose expectations include being surrounded by vast, open landscapes formed by the forces of nature, with the imprint of man's work substantially unnoticed, and opportunities for solitude or a primitive and unconfined type of recreation.

RECREATION RESOURCES

The increase in population in this sparsely populated region would generate new recreation needs and may place additional demands on nearby recreation resources, including Chaco Culture National Historical Park. Because of the likely proximity to the Bisti and De-na-zin WSAs, the increased noise, visual intrusions, and visitation by the new population would significantly affect the experience of solitude in the natural, uninhabited surroundings of these resource areas. Increased population from a new town in the study area could affect resource sites in the Santa Fe National Forest and recreation areas on the Jicarilla Apache Reservation because they would be the closest recreation resources available and accessible via NM 44. An increase in ORV use in the general vicinity of the new town area is likely (particularly when used for hunting, rock hounding, or artifact and fossil collecting). Extensive ORV use could affect the wilderness experience at the De-na-zin WSA and Bisti Badlands, as well as degrade the aesthetic quality of the surrounding landscapes by introducing noise and unnatural lines (tracks) across the terrain.

WILDERNESS VALUES

If a new town were located in the general proximity of the Bisti and De-na-zin WSAs, significant consequences could result from both its physical presence and increased use of the wilderness resources by the new town's residents. The physical presence of a new town, if visible from vistas within the WSA, could impair the scenic quality and natural character of the background landscape. Increased visitation, traffic noise, and

illumination would affect opportunities for solitude. Increased visitor use could result in litter, vandalism, and unauthorized use of ORVs in the WSAs, requiring additional supervision and maintenance from BLM.

TRANSPORTATION

Residential development along the unimproved county road would require upgrading of the road by San Juan County to accommodate regular vehicular traffic. At a minimum, the road would require drainage ditches, culverts, and surfacing for use during inclement weather. Potential positive consequences could result from the new town development once the access road is improved; specifically, commute traffic would be reduced during peak hours on NM 371 from Farmington to the NMGS plant site.

SOCIAL AND ECONOMIC CONDITIONS

If a new town were built in the 1980s, it would have an adverse effect on Farmington, Aztec, Bloomfield, and the unincorporated communities in northern San Juan County. The Farmington area seeks growth and is capable of managing and accommodating projected growth based on the analysis for NMGS. If a new town were constructed near NMGS, its residents would probably rely on the Farmington area as a primary source of retail goods, services, and entertainment. However, with the existence of the possible new town, Farmington and other communities would not benefit from increased population growth, or from a broader tax base.

Northern San Juan County would potentially benefit from construction of a possible new town only if the pace of energy development were to increase substantially beyond the levels projected for NMGS. If, for example, numerous simultaneous developments caused the regional population to "boom," northern San Juan County communities might not be able to accommodate all of the growth easily. The result would be "boomtown" conditions in the Farmington area--shortages of housing and necessary services, and a variety of other social and economic stresses.

Some NMGS workers might perceive the construction of a new town as a benefit because it could provide better or less expensive housing than would be available in the Farmington area, and because it would eliminate commuting (and its associated time, costs, and hazards). New housing stock in the new town would be in better condition than some of the existing housing in Farmington, and would probably be made attractive by developer subsidies, at least initially. Since the number and quality of services and amenities in the town cannot be estimated at this time, it is difficult to speculate on residential preferences. Many people, however, might still prefer residing in an older, established community with a full range of services.

In theory, Navajos would benefit from a new town because it would provide housing and other amenities better than those available in reservation communities, as well as easy access to jobs. In practice, however, Navajos have preferred to stay in communities on or near the reservation. Only about 5 percent of Farmington's population, for example, is Navajo, compared with 35 percent countywide. Thus Navajos seeking employment are likely to prefer commuting from Shiprock or Crownpoint rather than trying to integrate into a modern Anglo community. Further, more traditionally oriented Navajos who use the "checkerboard area" would certainly perceive the new town as an intrusion on their opportunities to continue traditional pursuits, including grazing and private ceremonies.

LAND USE CONTROLS AND CONSTRAINTS

The possible new town would not conflict with any existing formally adopted or formally proposed land use plans or policies in effect in the affected environment. The Navajo-Hopi land dispute settlements are discussed in the NMGS EIS section on land use controls and constraints and the NMGS EIS Controls and Constraints Technical Report.

SUGGESTED MITIGATION

Pending the receipt of ROW applications in support of a new town, a detailed project description and a detailed site-specific impact assessment would be used as the basis for developing relevant mitigation measures.

CUMULATIVE IMPACTS

INTRODUCTION

The proposed action discussed in this EIS is only one of several major resource commitments under consideration for the San Juan Basin for roughly the same time frame. By convention, impact analysis for any one proposed action is based on existing conditions, rational projections of these conditions into the future, and on new actions or projects that clearly are entrained in a development cycle (at the very least, approved and permitted for future implementation). Actions which may be highly probable for the future but are not yet approved are usually excluded from impact analysis. In the San Juan Basin, however, there is concern that the scale and simultaneity of several major proposed actions would lead to important cumulative impacts of a distribution and magnitude not contemplated by the EISs for the individual actions. To meet this concern, a cumulative impact study was conducted (called the Cumulative Overview), and its important findings have been summarized in this EIS. The Cumulative Overview is a companion document to these EISs and is filed with EPA as a part of each of them.

The three proposed actions considered in the Cumulative Overview (BLM 1982a) are the New Mexico Generating Station, the San Juan River Regional Coal Leasing, and Wilderness Area designation of the Bisti and De-na-zin Wilderness Study Areas. All three proposed actions would be implemented at roughly the same time, and some of the impacts of each action would overlap geographically or temporally with impacts from the other two proposed actions.

As used in the Cumulative Overview, cumulative impacts refer to "new" (previously undiscussed) information and are defined to be of two types:

1. Combinations of previously identified significant impacts (from individual EISs) that show increased levels of magnitude or severity from those presented in the EISs and that, therefore, represent qualitative changes in the bases for mitigation planning.
2. Combination of previously identified nonsignificant impacts that would occur coincidentally at sensitive or important locations, and in the aggregate would be considered significant.

This section is a summary of findings from the Cumulative Overview study. These findings are presented formally in the Cumulative Overview, and are supported by data and analytical descriptions presented in another document called Cumulative Overview Technical Report (BLM 1982b). Further detail on the other two individual proposed actions and their impacts is available in their respective EISs (BLM 1982c, 1982d).

This summary is organized into four subsections: this introduction, a review of the proposed actions, description of the portions of the environment affected by cumulative impacts, and a presentation of the cumulative environmental consequences.

Proposed Actions

Chapter 1 of this EIS provides a complete description of NMGS.

The San Juan River Regional Coal Leasing Program (SJRRCL) is a proposal to issue competitive coal leases on public lands in the San Juan Basin, beginning in 1983. The leasing would open from 1.2 billion to 1.5 billion tons of coal to production. The proposed leasing includes 24 tracts with estimated in-place

reserves of 1.32 billion tons. The EIS for SJRRCL also includes a discussion of a related proposal to issue noncompetitive federal coal leases on private and public lands in San Juan Basin areas where coal prospecting permits had been issued previously. Leases would be issued after defining the terms and conditions of each lease. This proposed action is called the Coal Preference Right Lease Applications (PRLAs) proposal, and could open about 2 billion tons of coal to production beginning in 1984.

The Wilderness Study Areas (WSAs) proposal involves three WSAs in the San Juan Basin, two of which are recommended for designation as Wilderness Areas, and both of which are close to NMGS. These are the Bisti and De-na-zin WSAs; together they encompass about 24,000 acres located north and east of NMGS. These WSA lands overlap in places with some PRLA tracts, and are close to other SJRRCL tracts.

AFFECTED ENVIRONMENT

Based on a preliminary analysis of the interactive effects of the proposed actions, nine impact topics were identified for further analysis. The affected resource groups are discussed briefly below.

AIR QUALITY

Air quality studies were concerned with the potential increase in concentrations of total suspended particulates (TSP). In a few small areas close to both NMGS and SJRRCL mines, there was concern that low-level dust concentrations from power plant and mining sources would combine to yield concentrations that would exceed prevailing standards. The study area for air quality was derived from dispersion modeling that delineated overlapping areas of measurable concentrations from both NMGS and SJRRCL; all mine locations within 25 km of NMGS were identified to be included in the analysis.

NOISE

Noise impacts were evaluated with respect to the WSAs. The concern was that the combined noise of blasting at mines, and haul road or worker traffic from both NMGS and SJRRCL mines, would be audible from within the WSAs and would degrade the quality of the wilderness experience to users of those areas. The study area included the Bisti and De-na-zin WSAs, and roads and mines within about 20 km of NMGS.

CULTURAL AND PALEONTOLOGICAL RESOURCES

The San Juan Basin presents an extensive body of physical evidence of a culture history dating back 10,000 years or more. The potentially affected cultural resources mainly are archaeological sites; other resources (objects, structures, or places) that have sociocultural significance to American groups are also potentially affected. Paleontological resources consist mainly of extensive fossiliferous beds which are internationally known for their richness and diversity. Together, the cultural and paleontological resources of the San Juan Basin provide unusual opportunities for research and interpretation because of their abundance, regional extension, and temporal depth.

The emphasis of cumulative impact analysis is on modifications to these regional sets of resources, and the consequent enhancement or degradation of the special qualities and opportunities that these regional sets provide. The impacts of interest are "indirect" because they do not concern direct modifications of specific resources, but rather generalized modifications to a body of resources. As a matter of subtle emphasis, it is the corpus of resources that is of concern, more than the component parts. Actions that would produce these indirect effects are cumulative increases in population in the region, and a cumulative increase in the attention invested in these resources by public agencies, in anticipation of and in response to the several proposed actions. The study area includes all of the San Juan Basin and extends into neighboring areas within one day's recreational drive (100 miles) of primary residential communities, particularly Farmington.

VISUAL RESOURCES

The concern of cumulative impact analysis for visual resources is increased visual contrast, as seen from a number of

key viewing points, resulting from the combined landscape-altering actions of proposed actions. Key elements of the affected environment in this analysis are the viewing points (within WSAs, designated park and recreation areas, highway access points, and other scenic areas), the expected modification (addition of structures, or changes to land, water, or vegetation elements of the landscape), and the limited areas within which modification from more than one project are visible from the selected viewing points. Because one of the proposed actions (designation of Bisti and De-na-zin WSAs as Wilderness Areas) is based partially on preservation of scenic quality, the delineation of areas where combined landscape modifications would occur considers only the effects of NMGS and SJRRCL.

The study area for cumulative visual impacts consists of overlapping portions of areas close to both NMGS and SJRRCL project features that are also visible from key viewing points within or adjacent to high quality scenic areas. The critical viewing distance from NMGS or SJRRCL features was a function of the degree of visual contrast associated with specific project features (e.g., stack, transmission line, mine pit, etc.).

RECREATION AND WILDERNESS RESOURCES

In addition to the two WSAs of direct concern, there are seven other WSAs within a day's recreational drive of the primary residential communities, along with numerous other recreational places ranging from important cultural sites (Chaco Culture National Historical Park) to national forests and state parks. Cumulative impact analysis was concerned with the potential loss or degradation of these recreation and wilderness areas, or with the degradation of their essential characteristics, resulting from an increased regional population and its demand for and use of these resources. The study area focused on the San Juan Basin, but also considered recreation user opportunities within 100 miles of Farmington and Grants.

TRANSPORTATION

Cumulative impact analysis focused on projected traffic volumes associated with the combined work forces of NMGS and SJRRCL, and the abilities of the area's existing roads to handle these higher volumes efficiently and safely. The study area was based on a projection of worker commute patterns; the roads of greatest interest were NM 371 from Farmington south to county roads C-5 and C-14, and portions of NM 44. Municipal roadways in the Farmington area were considered also.

SOCIAL AND ECONOMIC CONDITIONS

The NMGS and SJRRCL projects would produce changes in the region's population and potential economic structure. These changes, in turn, would alter population and economic characteristics, and the levels of demand for housing, infrastructure, and services. The cumulative impact analysis is concerned with the combined effect of these projects on the human environment (primarily communities) and on the institutions created to support it. When NMGS and SJRRCL are considered jointly over the years of their construction and operation, both the magnitude and timing of impacts change from what is reported at the individual project level in this and the other EIS. These cumulative impacts present a qualitatively different basis for mitigation planning from that which is presented for the two projects individually.

Preliminary analysis showed that the Farmington area was likely to attract direct and secondary population from both projects (Grants and Gallup are expected to be affected primarily by SJRRCL and not NMGS). Therefore the study area was limited to Farmington-area communities.

ENVIRONMENTAL CONSEQUENCES

Cumulative impacts were found to be greater or more severe than the simple sum of impacts reported for individual proposed actions; for all resources, cumulative impacts were determined to be significant. Table CI-1 is a summary of findings from the cumulative impact analysis. Brief descriptions of the for each resource are presented below.

AIR QUALITY

Increases of ambient total suspended particulate (TSP) concentrations

Table CI-1. SUMMARY OF AFFECTED RESOURCES CONSIDERED IN THE CUMULATIVE OVERVIEW

Resource	Study Area	Impact Topic	Indicator of Significance	Findings
Air Quality	12.5 km radius from NMGS, overlapping TSP contours from NMGS and SJRRCL. All mine locations within 25 km of NMGS were identified to include in the analysis.	Increase in total suspended particulate (TSP) concentrations from fugitive dust and stack emissions.	Concentrations ($\mu g/m^3$) in excess of any 24-hour or annual standard.	One small area close to Bisti mine No. 1 may experience TSP concentrations in excess of a standard; The potential for additional concentrations in excess of standards may occur in a worst-case situation in which a PRLA mine is located close to another mine (i.e. 1 km or less).
Noise	The study area included Bisti and De-na-zin WSAs, and mines and roads within 20 km of NMGS.	Increased noise levels from blasting, haul trucks, and employee-related travel.	Increment of 9 dB(A) above baseline noise levels in WSAs.	Increases in hourly noise levels greater than 9 dB(A) over baseline is predicted at the boundary of De-na-zin WSA, as a result of worker and haul road traffic in excess of 700 vehicles per hour on C-15.
Cultural and Paleontological Resources	Resources within 100-mile radius of greater Farmington area.	Primarily, indirect effects of increased exposure of resources to an increased population (i.e. vandalism, commercial looting, inadvertent damage) as well as deliberate conservation and interpretation of some resources.	Due to large numbers of sensitive resources and their prescribed significance (36 CFR 60.6, PL96-550, AIRFA, etc.), all adverse cumulative impacts are considered to be significant.	Impacts include conservation of some resources through land withdrawal, and preservation of important information through its acquisition and synthesis in connection with mitigation. Consumption of the resource base through research and mitigation activities, and loss of some resources to purposive or inadvertent disturbance of sites by a larger population.
Visual Resources	Overlapping portions of areas within selected visual ranges (3-10 miles) of NMGS and SJRRCL project features, which also are visible from key viewing points (primarily from WSAs, designated park and recreation areas, highway access points, and other scenic areas).	Degradation of scenic quality within the critical viewing distance from WSAs and other regionally important locations (e.g., cultural sites), due to landscape modifications from combined NMGS and SJRRCL actions.	Numerical contrast rating thresholds in the BLM VRM system (exceedence of any established threshold was considered to be significant).	Impacts from seven key viewing points, most significantly along the northern side of Chaco Culture National Historical Park, from within the WSAs, and at highway access points to these areas.

Table CI-1. SUMMARY OF AFFECTED RESOURCES CONSIDERED IN THE CUMULATIVE OVERVIEW (Concluded)

Resource Type	Study Area	Impact Topic	Indicator of Significance	Findings
Recreation/ Wilderness	Recreation areas and all WSAs (9 areas) within 100-mile radius from Farmington and Grants.	Loss or degradation of recreation or wilderness resources or their essential characteristics, primarily as a result of an increased regional population and its consequent demand for and use of these resources, or their close proximity to SJBAP actions.	Loss or degradation of resource areas from crowding of recreation facilities (based on unit-use standards); any degradation of essential environmental qualities (scenery, noise) associated with high quality recreation and wilderness experiences.	Degradation of the quality of wilderness experience in Bisti and De-na-zin WSAs, overcrowding of recreation areas close to Farmington and Grants, and degradation in the quality of dispersed recreation activities in the region.
Transportation	Roads and railroads linking Farmington area communities with Gallup and Grants-area communities. Includes all roads and railroads that provide access to NMGS and SJRRCL components.	Increased traffic volumes and safety hazards on existing roadways.	Increase in peak volume greater than peak volumes estimated for NMGS or SJRRCL individually, and close to, or greater than, designed roadway capacity or surface structure tolerance.	Significant overloading of NM 371 between Farmington and NMGS site.
Social and Economic Resources	Communities in the greater Farmington area (Farmington, Aztec, Bloomfield, Flora Vista, Lee Acres, and Lower Valley) where allocation of the combined increases in population from NMGS and SJRRCL have been made.	Employment, population growth, housing, community infrastructure and services, and public finances.	10 percent annual growth rate or greater in population or public revenue. Shortfall of projected public revenues to meet projected demands, or inability of private sector to meet such demands. Demand for community facilities and services (housing, municipal services, education, health and and human services, police and fire protection, recreation) in excess of existing and projected supply.	Significant population growth in 1985-86, significant expansion of regional economy from 1985-1995, excess housing demand in mid '80s and early '90s, shortfall of projected human services to demand. San Juan County would experience a slight deficit (approximately $17,000) in overall operating funds in 1984-85, and surpluses thereafter which could reach $2.6 million in 2000.
	Portions of San Juan Basin occupied and used primarily by the Navajo.	Opportunities to pursue traditional Native American values and lifestyles.	Reduction of opportunities to pursue traditional values and lifestyles.	Unquantified, but probably significant reduction in opportunities to pursue traditional lifestyles.

resulting from mining operations were projected by dispersion modeling for each mine, added to the modeled concentrations from NMGS, and then added to background levels. The results of this analysis are below all applicable national ambient air quality standards for TSP and the 24-hour New Mexico TSP standard. Total predicted levels of TSP in excess of the annual New Mexico standard (60 $\mu g/m^3$) were indicated in a small area within 2 kilometers from one mine boundary. It is not known at this time whether this area would be classified as "ambient air" (i.e., air to which the general public has access), since mine boundaries associated with PRLAs are not as yet defined. However, under worst-case assumptions, this exceedence of the annual New Mexico standard would constitute a significant impact. Significant TSP impacts were found for the air quality analysis in the SJRRCL EIS. Beyond this one minor area, the additional consideration of TSP levels related to NMGS did not combine to produce significant effects in the limited geographic area of TSP interaction for the two proposed actions.

NOISE

The combined noise effects of haul truck traffic (from both NMGS and SJRRCL mines), employee-related traffic from all projects, and blasting at the mines was considered in relation to its perception by users of the Bisti and De-na-zin WSAs. The analysis recognized that most of the people subject to project-related noise would be employees of these projects; noise impacts to employees are managed under environmental health and safety regulations, and it is assumed that "on-site" noise will be confined to levels that are not significant by regulatory definition, or are mitigated at the receptor.

Increased hourly noise levels greater than 9 dB(A), which roughly represents a doubling of perceived noise, were considered to be significant. Based on this indicator, significant noise impacts are projected in the wilderness assessment to occur at the boundary of Bisti WSA closest to NM 371 and the boundary of De-na-zin closest to county road C-15. From some locations within these WSAs, increased noise levels greater than 9 dB(A), resulting from traffic along the two above-mentioned roads, are projected to occur. These noise impacts could be lessened by reducing the number of vehicles, or by routing traffic away from sensitive areas.

CULTURAL AND PALEONTOLOGICAL RESOURCES

The following impacts were identified.

1. Conservation of resources within designated wilderness lands or in other specified areas, with well-planned withdrawal of information from these resources thorugh research and interpretation.
2. Acquisition and synthesis of signifi cant research information about the cultural and paleontological resources of the San Juan Basin, wheth er as part of well-scheduled data recovery prior to disturbance, or as emergency recovery of information and materials disturbed during project operations.
3. Consumption or depletion of a portion of the general San Juan Basin cultural and paleontological resource base, thus elevating the significance of remaining materials and traditions. Information gathered as a beneficial effect may be of diminished value to future researchers with as yet unknown research interests.
4. Increased uncontrolled loss of the cultural and paleontological resource base through inadvertent and malicious vandalism, commercial looting, and natural erosion of otherwise undisturbed sites because of increased local populations.

VISUAL RESOURCES

Based on an evaluation of visual contrast ratings of landscapes that would be modified by combined NMGS and SJRRCL features, and viewed from high-quality scenic areas, changes in visual resources were compared to Visual Resource Management objectives (according to the BLM-VRM system) for different classes of resources. Six adverse impacts were identified. They include significant degradation of visual quality of the landscape

as viewed from two locations on the northern side of Chaco Culture National Historical Park (Pueblo Alto and Pueblo Pintado), generalized reduction in visual quality from several locations within Bisti and De-na-zin WSAs (NMGS and SJRRCL features will be visible in many viewing directions from within these areas), and high contrast impacts on highway approaches to both the WSAs and Chaco Culture National Historical Park. Some mitigation may be achieved by softening the visual contrasts resulting from power transmission lines and surface mines, through design and cosmetic treatments. BLM could encourage visitor use in the enclosed portions of WSAs where natural features would buffer surrounding landscape disturbances.

RECREATION AND WILDERNESS RESOURCES

Based on the projected distribution of a significantly increased regional population, estimates were made of the probable demand for and participation in several recreation activities. It was assumed that high-quality recreation areas close to Farmington would be affected first, and that user preferences for recreation resources of the same class and quality would diminish generally with distance. Using this appproach, several recreation areas were predicted to become overcrowded, and thus potentially susceptible to degradation. In addition, direct impacts to recreation and wilderness areas close to NMGS and SJRRCL were considered, not so much from the standpoint of heavier visitation, but rather in relation to the findings of other resource analyses (visual resources, noise, etc.).

The assumption that users would seek more distant but equivalent recreation experiences if nearby areas were crowded is less plausible for the cumulative impact analysis than when only one project was considered. Recreation use associated with SJRRCL would tend to concentrate in the southern San Juan Basin, while users related to NMGS would tend to seek recreation areas nearer to Farmington. When both projects are considered together, all recreation resources in the Basin would be sought after and stressed at the same time, with few better prospects for a quality recreation experience available except at more remote locations, substantially outside of the Basin. The most seriously overcrowded areas in the Basin are likely to be Navajo Lake State Park, Angel Peak Recreation Area, Bluewater Lake State Park, and the Chaco Culture National Historical Park.

As pointed out in the discussions of impacts concerning visual resources and noise, some degradation in the quality of wilderness experience is expected within both the Bisti and De-na-zin WSAs.

TRANSPORTATION

Traffic volumes on roadways in the San Juan Basin were projected by combining worker commute volumes developed in the analysis of social and economic conditions, and haul truck volumes estimated in the noise analysis. These data were assembled for specific roads (according to projected commute patterns and mine locations) and for each year of operation of the NMGS and SJRRCL projects. Since transportation effects of either NMGS or SJRRCL would be significant without the influence of the other project, any increase in projected volume over site-specific EIS estimates was considered to be significant.

The most significant impact is projected to occur on NM 371 between Farmington and the NMGS plant site, where traffic volumes are likely to be about 100 percent greater than projected by the State Highway Department, and about 60 percent over standard maximum capacity for a roadway of that size and duty type. Since the magnitude of the cumulative impact is so great, consideration should be given to expanding the roadway from 2 lanes to 4 lanes.

SOCIAL AND ECONOMIC CONDITIONS

Cumulative impact analysis focused on two topics: rapid growth in the region, and the ability of communities to respond in a timely fashion with housing, services, and facilities; and decreased opportunities for the pursuit of traditional Native American values and lifestyles. The initiating event that would cause rapid growth and its consequences is an increase in employment

opportunities resulting from simultaneous development and operation of NMGS and SJRRCL. Together, the two projects would add approximately 9000 direct jobs at peak, generating, in addition, about twice that number of indirect jobs. About one-third of the population associated with these jobs would seek residence in the southern part of the region (centered on the Grants-Gallup axis), and would be a result primarily of SJRRCL mining activity, with or without NMGS. Therefore, the cumulative impact analysis focuses on communities affected by the joint employment opportunities of both NMGS and SJRRCL; these communities are located in the Farmington area.

Farmington area communities would be affected by about 6000 additional direct jobs and 12,000-13,000 indirect jobs. Consequent to the creation of employment opportunities affecting these communities would be increases in aggregate personal income and sharply increased demands for housing, infrastructure, and human services. Public finances would be affected in response to increased demands and increased public revenues from the new population. Traditional Native American values and lifestyles would be affected through a combination of a changing population composition, increased income, increased mobility, and a diminution of traditional support mechanisms (credit, public assistance, etc.).

The significant impacts were estimated to be:

1. Population growth in Farmington in 1985-86 at rates greater than 10 per cent per year. These growth rates are likely to be stressful to community resources, and may prefigure adverse social and economic conditions for several years beyond the periods of fastest growth.
2. Significant expansion of the regional economy from the mid-1980s through the 2020s, as measured in terms of employment, income, and public revenues. San Juan County would experience a slight deficit ($17,000) in overall operating funds in 1984-85 and surpluses thereafter which would reach $2.6 million in 2000.
3. Excess housing demand in the Farmington area in the 1985-1995 period.
4. Potential inability of human service agencies to keep pace with demand.
5. Unspecified but potentially significant impacts to Native Americans (especially Navajo), generally related to decreased opportunities to pursue traditional Native American lifestyles.

Chapter 4

CONSULTATION AND COORDINATION

THE SCOPING PROCESS

The Council on Environmental Quality Regulations Implementing the National Environmental Policy Act (40 CFR, Part 1501.7) require an early and open scoping process. During this process, the scope and importance of issues related to the Proposed Action were identified. Information obtained during the scoping process was one of the sources used to determine which impact topics would be addressed in detail in this EIS. Additional purposes of the scoping process were to inform affected federal, state, and local agencies and other interested parties about the proposed project, and to identify existing environmental reports and information related to the impact assessment.

The scoping process involved discussions with the public and resource specialists and managers of BLM and other relevant agencies. Written comments were received and compiled as a result of A-95 Clearinghouse distribution, Federal Register announcements, news releases, mailings, and articles about the proposal. Comments were also solicited during public scoping meetings. In addition, the initial scoping effort has been followed by an effort to continue agency and public involvement throughout the development of this EIS. This section outlines the steps taken by BLM for the scoping and public involvement process for the NMGS EIS.

An initial mailing list of more than 3000 names was developed to distribute information about the proposal and to inform the public about planned scoping meetings. A follow-up mailing of nearly 2000 letters (to individuals who had expressed interest) was made, reminding the public of the meetings. These meetings were announced in the Federal Register, news releases, and radio spots in both the English and Navajo languages.

A total of 16 scoping meetings were held. This scoping effort (the initial public involvement during the environmental process) was an attempt to scope the major issues, alternatives, and concerns for the NMGS EIS and Cumulative Overview. These activities ranged from a meeting with affected state legislators to meetings open to the general public.

Several scoping meetings designed for specific audiences were held to obtain information. All the meetings were open to the general public; however, each meeting was specifically oriented to one of the following groups:

1. General public
2. Native Americans
3. Local agencies
4. State agencies
5. Federal agencies

At all scoping meetings an introduction and summary of the NMGS proposal and the Cumulative Overview was presented. This summary was followed by slide and tape presentations that detailed the activities within the San Juan Basin. A Navajo-language tape was prepared for the meetings with Navajo chapters. For the federal, state, and local agency meetings and the Native American meetings, a question-and-answer period followed, allowing comments on major issues, concerns, and alternatives. At public meetings, a facilitator/nominal work group approach was used. This consisted of participants gathering into groups of 10 to 20 people, with 2 facilitators to moderate and document the issues and concerns. A summary of all issues and concerns was published and is available upon request from the

BLM NMSO (Scoping Analysis and Public Involvement, May 1981). Summaries of the meetings follow.

Federal Agency Meeting

On January 12, 1981, in Albuquerque, New Mexico, 11 representatives of federal agencies, including the National Park Service, Geological Survey, and Fish and Wildlife Service, attended a scoping meeting. Major issues raised included numerous air quality issues, coal source questions, and questions pertaining to the need for the project. Air quality concerns focused on regulatory mandates for "best available control technology" and compliance with both federal and state requirements.

State Agency Meeting

A meeting was held January 13, 1981, in Santa Fe, New Mexico, for state agency representatives. Participants included representatives from the State Planning Division, Natural Resources Department, State Highway Department, State Engineer, and Institute for Regional Education.

Major issues raised related to the availability of adequate water, including the potential loss of water to current users. The content of the Cumulative Overview was discussed, and concerns were raised about whether uranium, oil, gas, and other development would be incorporated into the Cumulative Overview. Additional questions and issues related to work-force requirements, increased population effects, and the possible new town.

Local Agency Meeting

A meeting held January 15, 1981, in Farmington, New Mexico, was attended by 12 representatives of local and regional agencies. Representatives of San Juan County, the Farmington School District, the City of Farmington, and the local Bureau of Indian Affairs Office attended.

Major concerns involved coordination with local agencies, jobs, and coal development. Questions relating to the development of EISs for coal mines were raised. Participants wanted to know who has the responsibility for site-specific mine plan EISs. People were also interested in knowing exactly where the mines would be located.

Local officials were very interested in the potential number of jobs that could be generated and the timing of these jobs. The local officials also expressed a desire to be kept involved throughout the process. An additional meeting was held with state legislators from San Juan County. The major interest expressed was in being kept informed.

Navajo Meetings

Four meetings at Navajo chapter houses in New Mexico were held during the week of January 19, 1981, as follows:

- Crownpoint, January 19
- Lake Valley, January 20
- Huerfano, January 21
- Pueblo Pintado, January 22

Approximately 300 Navajo people attended these sessions. The presentation was given in the Navajo language.

Major issues raised during these sessions included the expressed desire to be involved in the process, concern about an influx of non-Navajos into the area, air quality, water quantity and quality, and interest in the protection of sacred sites and areas.

Jicarilla Apache Meeting

On February 25, 1981, a session was held at Dulce, New Mexico, with representatives of the Jicarilla Apaches. Members of the tribal council, the Bureau of Indian Affairs, and Jicarilla Apache Tribal Consultants were among the 23 participants. Major concerns were about potentially reduced air quality and potential secondary impacts derived from increased population.

Participants felt that the addition of another generating station would significantly contribute to air quality degradation in the area. They expressed the desire to have the areal extent of BLM's analysis include the Jicarilla Apache Reservation.

Concerns about the possible impacts of increased population on roads, wildlife, recreation, water quality, and health and safety on the reservation were also raised.

Public Meetings

Meetings designed for all interested parties were held at several locations

during the first week of February 1981 and in Taos, New Mexico, on February 23, 1981. These meetings were publicized by a major informational mailing and through the media. The meetings were held as follows:

- Albuquerque, February 3: afternoon, 90 participants; evening, 55 participants
- Gallup, February 4: afternoon, 23 participants; evening, 10 participants
- Farmington, February 5: afternoon, 36 participants; evening, 45 participants
- Taos, February 23: evening, 58 participants

The major issues raised included questions of procedure, purpose and need, potential social impacts, water, and air quality.

Procedural questions generally focused on the proposed Ute Mountain Land Exchange EA. A large number of participants, particularly at the Albuquerque and Taos meetings, felt that by not including the proposed exchange in the NMGS EIS, a predetermination could be assumed. These people expressed the view that the Ute Mountain Exchange was the major driving force behind the NMGS proposal, and a similar concern was expressed about the PRLA EA.

During the Farmington meetings, a sentiment to speed up the procedure was widely expressed. Many participants wanted the proposed time frames shortened. Many of these participants were concerned that a long period of time between the imminent completion of the San Juan Generating Station and start of construction on the proposed NMGS could contribute to a "boom-bust" cycle in Farmington.

In Albuquerque and Taos, a number of questions about the need for NMGS were raised. This concern revolved around expressed skepticism about PNM's load forecasts and the participants' views that alternative renewable energy sources (solar and wind) and conservation could meet future need. The concept of out-of-state sales was also questioned at some length. Related to this overall concern was a desire to have independent need studies included in the decision process.

A great deal of comment was raised about social impacts at all sessions. This comment dealt with potential impacts to Native Americans in the area and concern about potential effects on existing social services (sewer, water, schools) in Farmington and Bloomfield.

Questions and concerns about water quantity and quality were major points of discussion. Numerous participants stated that the San Juan River was currently overallocated and that any additional use of the water could have severe impacts on downstream users. The alternatives of using ground water or water from uranium mines were also controversial topics. Potential adverse impacts from groundwater drawdown were described, as well as a fear that water from uranium mines would not be adequately treated and that radionuclides could be introduced to the plant and its environment. Numerous questions were also raised about possible impacts to water quality caused by acid deposition from the proposed plant, coal mine runoff, and other activities in the area.

Air quality impacts mainly associated with the proposed NMGS were discussed at length. Concerns included acid precipitation, general degradation of air quality, and the "greenhouse effect" on world climate.

<u>Written Comments</u>

In addition to comments received at the meetings, the BLM received approximately 75 written comments. Major issues raised in the letters reflected concerns similar to those expressed at the Taos and Albuquerque meetings. The written comments also focused on potential impacts to archaeological and paleontological resources.

ADDITIONAL AGENCY INVOLVEMENT

After the initial set of scoping meetings, a number of special activities were undertaken to further involve other agencies. Additional agency involvement was obtained through either formal or informal Cooperative Agreements.

The primary purpose of Agency Cooperative Agreements is to ensure that the agencies' expressed issues and concerns are adequately addressed in the EIS and that agencies with jurisdictional

concerns or expertise provide input into the environmental process. This is accomplished through input and review of data collection plans, technical reports, and the EIS. For agencies that have additional permitting requirements, the NMGS EIS would serve as the primary environmental analysis, thereby reducing duplication of effort. Cooperating Agencies are listed in NMGS Chapter 1. In addition to the formal cooperative agreements made with agencies, a number of other agencies were consulted to obtain data and information relevant to the analysis.

Meetings of representatives of formal and informal Cooperating Agencies were held in Santa Fe on March 25, May 5, and August 17, 1982. The purpose of the meetings was to give status reports on this EIS process, to consult the agencies on their review of the Preliminary DEIS and technical reports during May and June, and to solicit their comments and preferences on the assessment results and alternatives. A complete record of those contacts and the information and data provided is available in case file NM 30840 at the BLM NMSO in Santa Fe.

Table 4-1 indicates the formal (*) and informal Cooperating Agencies and the documents they reviewed (Preliminary DEIS and technical reports). The table also indicates documents for which agencies provided specific review comments during development of the NMGS DEIS and its associated technical reports.

ADDITIONAL PUBLIC INVOLVEMENT

Because of the long EIS preparation time, it was determined that public involvement would be needed, in addition to the initial public scoping process. Public involvement consisted of meetings with individuals and interested groups on a request basis and another set of formal public meetings held in March 1982.

Meetings with Interested Groups

Several meetings were held in BLM offices in Santa Fe with representatives of Southwest Research and Information Center and the Committee on Coal. These meetings were held to discuss BLM's approach to the EIS. Specific topics included purpose and need, alternatives, and procedural questions. Records of these meetings are available in files at the BLM NMSO. These contacts will continue throughout the environmental analysis and decision-making process.

Public Meetings

Three public meetings were held in the first week of March 1982.

- Taos, March 1, 75 participants
- Farmington, March 3, 55 participants
- Albuquerque, March 4, 65 participants

Representatives of BLM, PNM, and WCC presented status reports on the progress of the EIS and related projects, including the San Juan Basin Action Plan (SJBAP) projects, agency involvement, PNM's planning efforts, alternatives under consideration, and future plans.

Major areas of questioning were: need for the project, procedural issues, BLM's site selection review process, alternatives to meet the project need, and environmental issues related to air, water, cultural resources, Chaco Culture National Historical Park, WSAs, and social and economic effects in the proposed plant site area and Farmington vicinity.

Table 4-1. COOPERATING AGENCY REVIEW OF NMGS PRELIMINARY DRAFT EIS AND ASSOCIATED TECHNICAL REPORTS

Cooperating Agency	PDEIS	Air Quality	Geologic Setting	Mineral Resources	Paleontology	Soils, Prime & Unique Farmlands	Hydrology/ Water Quality	Vegetation	Wildlife & Aquatic Biology	Cultural Resources	Visual Resources	Recreation	Wilderness	Transportation	Social & Economic (incl. Native Amer.)	Land Use Controls & Constraints	Threatened & Endangered Species	Project Description	Purpose & Need	Alternatives to the Project
BIA, Albuquerque Area Office*	R/C	—	—	—	—	—	R/C	—	—	R/C	—	—	—	—	R	—	—	R	R	—
BIA, Eastern Navajo Agency*	R	R	R	R	R	R	R/C	R	R	R/C	R	R	R	R	R	R	R	R	R	R
BIA, Navajo Area Office*	R/C	R	—	R	R	R	R/C	R	R/C	R	R	—	—	—	R	R/C	R/C	—	—	—
Bureau of Reclamation*	R/C	—	—	—	—	—	R	—	R	R/C	—	—	—	—	—	—	R	—	—	—
Corps of Engineers*	R/C	R	R	R/C	R/C	R/C	R	R	R/C	R/C	R	R/C	R/C	R/C	R	R	R/C	R	R	R
Environmental Protection Agency	R/C	R/C	R/C	—	—	—	R/C	—	—	—	R/C	—	—	R/C	R/C	R/C	—	R/C	R	R
Fish and Wildlife Service*	R/C	R	—	—	—	—	R	R	R	—	—	R	—	—	—	R	R/C	R	R	—
Forest Service*	R/C	R	—	—	—	—	R/C	R/C	R/C	R	R/C	R/C	R/C	R/C	R/C	R	R/C	R/C	—	—
Minerals Management Service*	R/C	—	R/C	R/C	R/C	—	—	—	—	—	—	—	—	R	—	R	—	R	R	R/C
National Park Service*	R/C	R/C	R	R	—	R	R	R	R	R	R/C	R/C	R/C	R/C	R	R	R/C	R	R	R
Soil Conservation Service	R/C	—	—	—	—	R/C	R	R	—	—	—	—	—	—	R	R	—	R	—	—
U.S. Geological Survey	R	—	—	—	—	—	R/C	—	—	—	—	—	—	—	—	—	—	—	—	—
NM Energy and Minerals Dept.*	R	—	R	R	—	—	—	—	—	—	—	—	—	R	R	R	—	R	R	R
NM Environmental Improvement Div.	R	R/C	R	—	—	—	R/C	—	—	—	R	—	—	R	—	R	—	R	R	R
NM Natural Resources Dept.	R	—	—	—	—	R	—	R/C	R	R	R	R	R	—	—	R	R	R	R	R
NM State Planning Office	R/C	—	—	R	—	—	R	—	R	R/C	R	R	R	R	R	R	R	R	R	R
NM Public Service Commission	R	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	R	R	R
NM State Engineer's Office	R	R	—	—	R	—	R/C	—	—	—	—	—	—	—	—	—	—	—	—	—
NM State Historic Preservation Officer	R	—	—	—	—	—	—	—	—	R/C	—	—	—	—	R/C	—	—	—	—	—
Navajo Tribe*	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Zia Pueblo*	R	—	—	—	—	—	R	—	R	R	—	—	—	—	R	R	—	R	—	R

Note: * = formal Cooperating Agency.
R = reviewed by agency.
R/C = reviewed by agency; comments provided.
— = not reviewed.

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WOODWARD-CLYDE CONSULTANTS (WCC)

Woodward-Clyde Consultants was selected to assist the BLM in preparing this EIS during a selection process conducted in the autumn of 1980. In accordance with CEQ Regulations (1506.5(c)): the contractor was solely selected by the lead agency; the contractor executed a disclosure statement specifying that it has no financial or other interest in the outcome of the project; and the lead agency provided guidance throughout the development of the EIS and has responsibility for its scope and content. Contractor preparers are listed below.

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WCC Preparer	EIS Responsibility	Education	Years Related Experience
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WCC Preparer	EIS Responsibility	Education	Years Related Experience
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WCC Subcontractor	EIS Responsibility
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  - Soil Conservation Service
    - Steve Neville
  - U.S. Corps of Engineers
    - William Tully
  - U.S. Forest Service
    - Ben Wallingford
  - Environmental Protection Agency
    - Clinton Spottes
  - Department of the Interior
    - Ray P. Churan
    - Robert Uram

- <u>State of New Mexico</u>
  - Environmental Improvement Division
    - Mark Jones
  - Public Service Commission
    - J.R. Reid
  - State Engineer Office
    - D.E. Gray
  - Historic Preservation Bureau
    - Daniel Riley
  - Energy and Minerals Department
    - Duffy Ruimerman
  - State Planning Office
    - Charles Salazar, Dave Martinez
  - Natural Resource Department
    - Bill Isaacs

- <u>Tribal</u>
  - Pueblo of Zia
    - Stanley Pino
  - Navajo Tribe
    - Raymond Lancer, Ronald Izzo

AGENCIES CONSULTED

FEDERAL

<u>Advisory Council on Historic Preservation</u>

<u>Department of Agriculture</u>
- <u>Forest Service Offices</u>
  - Cibola National Forest
  - San Juan National Forest
- <u>Soil Conservation Service Offices</u>
  - Albuquerque, New Mexico
  - Aztec, New Mexico
  - Cuba, New Mexico
  - Gallup, New Mexico
  - Grants, New Mexico
  - Rio Rancho, New Mexico

<u>Department of Energy</u>
- Federal Energy Regulatory Commission

<u>Department of the Interior</u>
- Bureau of Indian Affairs
  - Crownpoint, New Mexico
  - Window Rock, Arizona
  - Albuquerque, New Mexico
- Bureau of Land Management
  - Washington Office
  - New Mexico State Office
  - Albuquerque District
  - Farmington Resource Area Headquarters
  - Taos Resource Area
- Bureau of Reclamation
  - Amarillo, Texas
  - Durango, Colorado
  - Salt Lake City, Utah
- Field Solicitor's Office
- Heritage Conservation and Recreation Service
- Minerals Management Service
  - Albuquerque, New Mexico
  - Farmington, New Mexico
- National Park Service
  - Chaco Culture National Historical Park
  - Southwest Region
  - Division of Cultural Research, Southwest
    - Cultural Resources Center
      - Albuquerque, New Mexico
      - Santa Fe, New Mexico

Office of Environmental Project Review
Washington, D.C.
U.S. Fish and Wildlife Service
Albuquerque, New Mexico
U.S. Geological Survey
Albuquerque, New Mexico

Department of Transportation
Washington, D.C.

Environmental Protection Agency
Region VI Office, Dallas
Region VIII Office, Denver
Region IX Office, San Francisco

Nuclear Regulatory Commission

U.S. Army Corps of Engineers
Albuquerque District

Water Resources Council
Washington, D.C.

INDIAN TRIBES

Acoma Pueblo
Cochiti Pueblo
Isleta Pueblo
Jemez Pueblo
Jicarilla Apache
Laguna Pueblo
Navajo Tribe
Sandia Pueblo
San Felipe Pueblo
Santa Ana Pueblo
Santa Domingo Pueblo
Zia Pueblo
Zuni Pueblo

STATE OF NEW MEXICO

A-95 Clearinghouses
Bureau of Mines and Mineral Research
Energy and Minerals Department
Environmental Improvement Division
Natural Resources Department
- Department of Game and Fish
- Interstate Stream Commission
- State Engineer
- State Heritage Program
Public Service Commission
Soil and Water Conservation Districts
State Archaeologist
State Highway Department
State Historic Preservation Officer
State Land Office

UNIVERSITIES, COLLEGES, AND RESEARCH INSTITUTIONS

Arizona Museum of Natural History
Eastern New Mexico University
Museum of Northern Arizona
New Mexico Energy Institute
New Mexico Institute of Mining and Technology
New Mexico Museum of Natural History
New Mexico Solar Energy Institute
New Mexico Technical Institute
University of Arizona
University of California, Berkeley
University of Kansas
University of New Mexico, Albuquerque
University of New Mexico, Las Cruces
U.S. National Museum, Smithsonian Institution

LOCAL

City of Aztec
City of Bloomfield
City of Farmington
- Municipal Schools
- Police Department
McKinley Area Council of Governments
McKinley County
San Juan County
- Human Services Department, Social Services Division
- Sheriff's Department

OTHER

Upper Colorado River Commission, Salt Lake City
San Juan Generating Station Personnel Department

LIST OF TECHNICAL REPORTS

1. Purpose and Need
2. Project Description
3. Alternatives to the Project
4. Site Alternatives
5. Permit Reconnaissance
6. Air Quality
7. Geologic Setting
8. Mineral Resources
9. Paleontology
10. Soils, Prime and Unique Farmlands
11. Hydrology
12. Water Quality
13. Vegetation
14. Wildlife and Aquatic Biology
15. Threatened and Endangered Species
16. Cultural Resources
17. Visual Resources
18. Recreation Resources
19. Wilderness Values
20. Transportation
21. Social and Economic Conditions
22. Land Use Controls and Constraints

AVAILABILITY OF TECHNICAL REPORTS FOR PUBLIC REVIEW

Individual copies of the technical reports can be obtained for a copy fee. Inquiries should be directed to:

Bureau of Land Management, New Mexico State Office
Title Records and Public Assistance Section (943B)
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6107 FTS 476-6107

Copies of the reports are available for public review at the locations listed below. [Formal and informal cooperating agencies are denoted by an asterisk (*).]

BUREAU OF LAND MANAGEMENT OFFICES

New Mexico State Office

NMGS Project Staff (934A)
Room 122, Federal Building
Cathedral Place
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6184 FTS 476-6184

San Juan Energy Projects Staff (911)
Room 129, Federal Building
Cathedral Place
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6226 FTS 476-6226

Public Affairs Staff (912)
Room 2016
U.S. Post Office and Federal Building
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6316 FTS 476-6316

Division of Resources (930)
509 Camino de los Marquez, Suite 3
P.O. Box 1449
Santa Fe, NM 87501
(505) 988-6212 FTS 476-6212

Albuquerque District Office
3550 Pan American Freeway NE
P.O. Box 6770
Albuquerque, NM 87107
(505) 766-2455 FTS 474-2455

Farmington Resource Area Headquarters
900 La Plata Road
P.O. Box 568
Farmington, NM 87401
(505) 325-3581

Taos Resource Area Office
Montevideo Plaza
P.O. Box 1045
Taos, NM 87571
(505) 758-8851

Socorro District Office
198 Neel Avenue
P.O. Box 1219
Socorro, NM 87801
(505) 835-0412 FTS 476-6280

Las Cruces District Office
1705 N. Valley Drive
P.O. Box 1420
Las Cruces, NM 88001
(505) 524-8551 FTS 571-8312

Roswell District Office
1717 W. Second Street
P.O. Box 1397
Roswell, NM 88201
(505) 622-7670 FTS 476-9251

Carlsbad Resource Area Headquarters
114 S. Halagueno Street
P.O. Box 506
Carlsbad, NM 88220
(505) 887-6544

OTHER DEPARTMENT OF THE INTERIOR AGENCIES

Bureau of Indian Affairs*
Albuquerque Area Office
123 4th Street
P.O. Box 2088
Albuquerque, NM 87198
(505) 766-3374 FTS 474-3374

Bureau of Indian Affairs*
Eastern Navajo Agency
P.O. Box 328
Crownpoint, NM 87313
(505) 786-5228

Bureau of Indian Affairs*
Navajo Area Office
Box M - Mail Code 305
Window Rock, AZ 86515
(602) 871-5151 FTS 479-5314

Bureau of Reclamation*
Upper Colorado Regional Office
125 S. State Street
P.O. Box 11568
Salt Lake City, UT 84147
(801) 524-5463 FTS 588-5463

Minerals Management Service*
South Central Region
505 Marquette Avenue NW, Suite 815
Albuquerque, NM 87102
(505) 766-1173 FTS 474-1173

Minerals Management Service*
Resource Evaluation Office
411 N. Auburn
Farmington, NM 87401
(505) 327-7397 FTS 572-6254

National Park Service*
Southwest Regional Office
1100 Old Santa Fe Trail
Santa Fe, NM 87501
(505) 988-6375 FTS 476-6375

National Park Service*
Environmental Coordination Office
Pinon Building, 1220 St. Francis Drive
P.O. Box 728
Santa Fe, NM 87501
(505) 988-6681 FTS 476-6681

U.S. Fish and Wildlife Service*
Field Supervisor, Ecological Services
3530 Pan American Highway, Suite C
Albuquerque, NM 87107
(505) 766-3966 FTS 479-3966

U.S. Geological Survey (WRD)*
505 Marquette Avenue, Room 720
Albuquerque, NM 87101
(505) 766-2810 FTS 474-2817

OTHER FEDERAL AGENCIES AND ORGANIZATIONS

Environmental Protection Agency*
Region VI
1201 Elm Street
Dallas, TX 75270
(214) 767-2716 FTS 729-2716

Navajo Tribe*
c/o Division of Resources
P.O. Box 308
Window Rock, AZ 86515
(602) 871-6592

Pueblo of Zia*
General Delivery
San Ysidro, NM 87053
(505) 867-3304

Soil Conservation Service*
424 N. Mesa Verde
Aztec, NM 87410
(505) 334-9437

U.S. Corps of Engineers*
P.O. Box 1580
Albuquerque, NM 87103
(505) 766-2657 FTS 474-2657

USDA, Forest Service*
717 Gold Avenue
Albuquerque, NM 87102
(505) 474-1676 FTS 474-1676

USDA, Forest Service*
District Ranger
Mt. Taylor Ranger District
201 Roosevelt Avenue
Grants, NM 87020
(505) 287-8833

<u>USDI, Bureau of Land Management</u>
Division of Rights-of-Way (330)
18th and C Streets, NW
Washington, D.C. 20240
(202) 343-5441 FTS 343-5441

<u>USDI, Bureau of Land Management</u>
Denver Service Center (D-460)
Technical Publications Library
Denver Federal Center, Bldg. 50
Denver, CO 80225
(303) 234-2368 FTS 234-2368

NEW MEXICO STATE AGENCIES

<u>New Mexico State Environmental Improvement Division</u>*
725 St. Michaels Drive
P.O. Box 968
Santa Fe, NM 87503
(505) 827-5217, ext. 2416

<u>New Mexico Energy and Minerals Department</u>*
525 Camino de los Marquez
P.O. Box 2770
Santa Fe, NM 87503
(505) 827-3326

<u>New Mexico Historic Preservation Bureau</u>*
State Historic Preservation Officer
505 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-2108

<u>New Mexico Natural Resource Department</u>*
Villagra Building
Santa Fe, NM 87503
(505) 827-5531

<u>New Mexico Public Service Commission</u>*
Bataan Memorial Building
Santa Fe, NM 827-3361
(505) 827-3361

<u>New Mexico State Engineer's Office</u>*
Bataan Memorial Building
Santa Fe, NM 87503
(505) 827-2423

<u>New Mexico State Planning Office</u>*
505 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-5191

OTHER ORGANIZATIONS

<u>Public Service Company of New Mexico</u>
Alvarado Square
P.O. Box 2268
Albuquerque, NM 87158
(505) 848-2700

<u>Woodward-Clyde Consultants, Inc.</u>
3 Embarcadero Center, Suite 700
San Francisco, California 94111
(415) 956-7070

PUBLIC AND UNIVERSITY LIBRARIES

Reading copies of the NMGS EIS and associated technical reports will be available at the following public and university libraries:

<u>State and Public Libraries</u>

<u>Albuquerque Public Library</u>
501 Copper Avenue NW
Albuquerque, NM 87102

<u>Aztec Public Library</u>
201 W. Chaco
Aztec, NM 87401

<u>Crownpoint Community Library</u>
c/o Lioness Club, P.O. Box 731
Crownpoint, NM 87313

<u>Cuba Public Library</u>
Box 5, La Jara
Cuba, NM 87027

<u>Farmington Public Library</u>
302 N. Orchard
Farmington, NM 87401

<u>Gallup Public Library</u>
115 W. Hill Avenue
Gallup, NM 87301

<u>Mother Whiteside Memorial Library</u> (Public)
525 W. High Street
P.O. Box 96
Grants, NM 87020

<u>New Mexico State Library</u>
325 Don Gaspar Avenue
Santa Fe, NM 87503

Harwood Foundation Library (Public)
25 LeDoux
P.O. Box 766
Taos, NM 87571

University/College Libraries

University of New Mexico
General Library
Albuquerque, NM 87131

Navajo Community College Library
Shiprock Branch
P.O. Box 580
Shiprock, AZ 87420

Northern New Mexico Community College
P.O. Box 250
Espanola, NM 87532

University of New Mexico, Gallup Campus
Learning Resources Center
200 College Road
Gallup, NM 87301

New Mexico State University/Grants
1500 Third Street
Grants, NM 87020

New Mexico Highlands University
Donnelly Library
National Avenue
Las Vegas, NM 87701

College of Santa Fe
Fogelson Memorial Library
St. Michaels Drive
Santa Fe, NM 87501

New Mexico State University
San Juan Campus
4601 College Blvd.
Farmington, NM 87401

Acid precipitation Refers to precipitation with pH lower than 5.6. Precipitation is naturally somewhat acidic (with a pH of about 5.6) because of the dissolution of atmospheric carbon dioxide to form carbonic acid. Precipitation with a pH lower than 5.6 is indicative of substances other than CO_2 causing the acidity. Sulfuric, nitric, and, to a lesser extent, hydrochloric acid, contribute to the lower pH values of acid precipitation. It is generally recognized that fossil fuel combustion forms precursors to acid precipitation, although its importance is not clear.

Alkaline Having a pH of more than 7.

Alluvium Clay, silt, sand, and gravel or other rock material transported by flowing water and deposited as sorted or semisorted sediments.

Ambient In the case of air quality, the portion of the atmosphere external to buildings, to which the general public has access.

Ambient pollutant concentrations Existing levels of contaminants in the local or regional air, usually pertaining to concentrations of particulate matter, sulfur dioxides, nitrogen oxides, ozone, and trace elements.

Aquifer One or more formations that contain sufficient permeable material to yield significant quantities of water to wells and springs.

Arroyo Small, deep, flat-floored channel or gully of an ephemeral or intermittent stream, usually with vertical or steeply cut banks of unconsolidated material.

Attainment A designation issued by the EPA to indicate an area's compliance with all applicable National Ambient Air Quality Standards (NAAQS). An area that is in compliance with the particulate matter standard, for example, is termed "attainment" for this pollutant. An area that is shown by monitoring or modeling to exceed a standard is designated "non-attainment" for the particular pollutant(s).

Backfill Earth that is replaced after a construction excavation.

Badlands A region nearly devoid of vegetation where erosion, instead of carving hills and valleys of the ordinary type, has cut the land into an intricate maze of hollow ravines and sharp crests and pinnacles.

Baseline Air quality, water quality, or meteorological data used as a starting point in estimating the impact of new emissions.

Bedrock A general term for the rock, usually solid, that underlies soil or other consolidated, superficial material.

Biochemical Characterized by, produced by, or involving chemical reactions in living organisms.

Biomass energy technology A process of generating energy utilizing biomass (solid waste, agricultural, and forest residues, etc.) as the fuel. The biomass can be burned to generate heat that warms a boiler and creates steam, or it can be fermented and distilled to make clean-burning fuels such as methanol.

Biota The plant and animal life in an area.

Blowdown The quantity of recirculating cooling water that is discharged on a continuous basis in order to control the gradual buildup of dissolved and suspended substances in a closed-cycle cooling system.

Borrow area Area from which earth material is obtained for use elsewhere.

Breakers (placed over pipe for erosion control)

Candidate species A species that is being reviewed by the Fish and Wildlife Service to determine if there is sufficient cause to propose the species for inclusion as threatened or endangered on the federal list.

Category 1,2 species Category 1 status review species are plant species that are officially recognized by the Fish and Wildlife Service as high-priority candidates for federal threatened and endangered status but have not yet been formally proposed. Category 2 status review species are plant species that are lower-priority candidates than category 1 for federal threatened and endangered listing, due to lack of biological information.

Cathodically protected Protected against corrosion by means of a weak electric current applied to the pipeline to offset the galvanic action causing metal corrosion.

Chlorinated Treated with chlorine or a chlorine compound; e.g., used for purification of water.

Cooling tower A towerlike device in which atmospheric air circulates and cools warm water, generally by direct contact (evaporation).

Cretaceous The final period of the Mesozoic era thought to have covered the span of time between 135 and 65 million years ago.

Crucial winter range Range that is crucial to game (usually big game) survival because it provides browse and cover during winter months when other habitat is not able to provide for these crucial needs.

Cultural resources Remains of human activity, occupation, or endeavor, as reflected in sites, buildings, artifacts, ruins, etc.

Cut-and-fill Excavation and grading operation entailing achievement of uniform grade by moving excess material from hills into valleys.

Decibel A unit for expressing the relative intensity of sounds on a scale from 0 (for the average least perceptible sound) to about 130 (for the average pain level).

Decommissioning The act of taking a power generating or industrial facility out of service, sometimes referred to as mothballing.

Dike Berm or embankment designed to contain a body of water.

Dissected plateaus A plateau in which a large part of the original surface has been deeply cut by streams.

Diurnal Occurring in the daytime.

Downwash (air movement) The downward deflection of air, relative to the direction of motion of an airfoil.

Drawdown The decline in the potentiometric head in an aquifer at a specified period of time. Drawdown is also defined as the difference between the elevation of the water level in a well under non-pumping (static) conditions and the elevation under pumping conditions.

Drift (tower water) The water lost in a cooling tower as mist or droplets entrained by the circulating air, not including the evaporative loss.

Econometrics The use of sophisticated mathematical, statistical, and other analytic methods to make quantitative economic analyses.

Effluent The mixture of substances, gases, liquids, and suspended matter discharged into the atmosphere (or ground, river, ocean) as the result of a given process.

Electromagnetic Related to magnetism developed by electric current.

Electrostatic precipitator A means of removing particulates from gases. Particles are given an electrical charge and attracted to a plate with an opposite charge.

Emission A substance, whether gaseous or particulate, released by human activity into the air or water.

Endangered species Any species that is in danger of extinction throughout all or a significant portion of its range (Endangered Species Act, 1973).

Entrainment To draw in and transport by the flow of a fluid.

Ephemeral stream A stream or reach of a stream that flows briefly only in direct response to precipitation in the immediate locality and whose channel is at all times above the water table.

Erosion The general process or processes whereby rock material is loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies.

Ethnography Descriptive anthropology; science that deals with the division of people into races and their origin, distribution, relations, and characteristics.

Evaporation ponds Large ponds where used water, degraded to the extent that is cannot be treated for further in-plant use, is discharged.

Exogenous Originating from or due to outside causes.

Extirpation Complete destruction; extermination.

Fault Fracture in the earth's crust accompanied by displacement of one side of the fracture with respect to the other and in a direction parallel to the fracture.

Fault trace The surface expression of a fault plane.

Floodplain Lands that are periodically covered by flood waters.

Fugitive dust Particulate matter composed of soil which is uncontaminated by pollutants resulting from industrial activity.

Geologic unit A recognizable rock unit based either on its lithologic (mappable) or its time-stratigraphic characteristics; a discrete body of rock recognizable by unique characteristics.

Greenhouse effect Warming of the earth's surface and the lower layers of atmosphere that tends to increase with increasing atmospheric carbon dioxide and that is caused by conversion of solar radiation into heat in a process involving selective transmission of shortwave solar radiation by the atmosphere, its absorption by the earth's surface, and reradiation as infrared which is absorbed and partly reradiated back to the surface by carbon dioxide and water vapor in the air.

Ground water That part of the subsurface water that is the zone of saturation, supplies water to wells, and provides water that sustains the low flow of perennial streams.

Grouting Injection of soil or rock with chemicals, cement, or other materials to improve the strength or reduce the permeability.

Intake The place at which a liquid (primarily water) is taken into a pipe, channel, etc.

Intermittent stream (a) A stream or reach of a stream that drains a watershed of at least 1 square mile, or (b) a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and ground-water discharge.

Lithologies The physical character of rocks including color, mineralogic composition, and grain size.

Magnetohydrodynamics Of or relating to phenomena arising from the motion of electrically conducting fluids in the presence of electric and magnetic fields.

Main power block The main power block consists of a series of generating units that include the turbine generator, boiler, particulate removal system, and chimney stack.

Matrilineal Tracing descent through the maternal line.

Matrilocal Located at or centered around the residence of the wife's family or people.

Multiple regression A regression in which one variable is estimated by the use of more than one other variable.

Nitrogen dioxide A molecule of one nitrogen and two oxygen atoms: NO_2.

Nitrogen oxides (NO_x) Compounds produced by combustion, particularly when there is an excess of air or when combustion temperatures are very high. Nitrogen oxides are primary air pollutants.

Nominal rating A designated or theoretical output that may vary from the actual.

Nonattainment area An area already characterized by significant levels of air pollution. Such areas are restrictive of any significant increases in certain pollutants caused by new sources (industrial or power plant).

100-year flood level The flood level with a 1 percent probability of occurring within any given year based on past recorded floods or computed drainage flows.

Overburden The earth, rock, and other materials that lie above a mineral deposit.

Ozonated Treated or combined with ozone (O_3).

Ozone A molecule of three oxygen atoms: O_3.

Paleocene An epoch of the early Tertiary period and the corresponding worldwide series of rock.

Paleontology A science that deals with the life of past geological periods and is based on the study of fossil remains of plants and animals.

Particulate matter Any material, except water in a chemically uncombined form, that is or has been airborne and exists as a liquid or a solid at standard temperature and pressure conditions. Minute particles of coal dust, fly ash, and oxides temporarily suspended in the atmosphere.

Percolation Slow movement of water through small openings within porous material such as sandstone.

Perennial stream a stream or part of a stream that flows continuously during all of the calendar year as a result of ground-water discharge or surface runoff. The term does not include intermittent stream or ephemeral stream.

pH A number that represents the negative logarithm, base 10, of the hydrogen-ion activity of a solution. A pH less than 7 indicates an acid solution; a pH greater than 7 indicates an alkaline solution.

Plume The volume of air space containing any of the substance emitted from a point source. For practical purposes, the limits of a plume have to be arbitrarily defined according to some minimum concentrations of the substance.

Potentiometric surface A surface that represents the static water level or head in an aquifer. In a confined aquifer, it is defined by the levels to which water will rise in tightly cased wells. The water table is a particular potentiometric surface.

Prehistory The time before written history.

Prime or unique farmland Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (e.g., not urban built-up land). Numerous specific SCS criteria must be met for a soil to qualify as potential Prime Farmland. For a soil to qualify as Prime Farmland (in the NMGS project area in New Mexico), it must meet the specific criteria and be irrigated. Unique Farmland is land other than Prime Farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods.

Quarternary The second period of the Cenozoic era as well as the corresponding system of rocks. It began two to three million years ago and extends to the present.

Radionuclides A radioactive nuclide.

Raptor Predatory bird, such as the eagle, hawk, or owl.

Regime (temp., nutrient, etc.) The characteristic behavior or orderly procedure of a natural phenomenon or process.

Riparian Relating to or living on the bank of a river, pond, lake or stream.

Riprap A foundation or sustaining wall of stones (as on an embankment slope) to prevent erosion.

Saline A general term of the naturally occurring soluble salts, such as common salt, sodium carbonate, sodium nitrate, potassium salts, and borax.

Sandstone Any clastic sedimentary rock containing individual particles that are visible to the unaided eye or slightly larger.

Scaling Thin coating, layer, or incrustation; hard incrustation that builds on side of boiler vessel.

Secondary effects Derived from original, or primary, effects.

Sedimentation The process of forming or accumulating sediment in layers.

Sedimentary Rocks that are formed by the deposition of a sediment.

Shale A fine-grained sedimentary rock formed by the consolidation of clay silt or mud. It is characterized by a finely laminated structure which imparts fissility parallel to bedding.

Siltation The deposition or accumulation of silt that is suspended throughout a body of standing water.

Siltstone An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility.

Sludge A semifluid, slushy, murky mass of sediment resulting from treatment of water, sewage, or industrial and mining wastes.

Spoil Material that has been removed from its original location by mining operations and that is unacceptable for structural fill.

State-listed species Species that are classified by a state as threatened, endangered, rare, or otherwise restricted in distribution and number. Classifications do not necessarily correspond to Fish and Wildlife listings. These species are legislatively protected only if specific state statutes have been approved.

Strata Layers of sedimentary rock visually separable from other layers above and below.

Stringing pipe Placing joints of pipe end-to-end along a pipeline right-of-way in preparation for welding the joints together to form a pipeline.

Subbituminous coal A black coal intermediate in rank between lignite and bituminous coals.

Subsidence Movement in which surface material is displaced vertically downward.

Substrate Soil, organic, and/or rock materials found on the bottom of aquatic habitat.

Sulfur dioxide (SO_2) Heavy, pungent, toxic gas that is easily condensed to a colorless liquid, is used in making sulfuric acid, and is a major air pollutant, especially in industrial areas.

Tectonic A branch of geology dealing with the regional assembling of structural or deformational features; a study of their mutual relations, origin, and historical evolution.

Tertiary The first period of the Cenozoic era, thought to have covered the time span between 65 and 3 to 2 million years ago.

Thermochemical The interrelation of heat with chemical reaction on physical change of state.

Threatened species Any animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Tiering Incorporation of the existing data base by reference to relevant environmental documents.

Total dissolved solids (TDS) An aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts and are dissolved in water. High TDS values can adversely affect humans, animals, and plants. TDS is often used as a measure of salinity.

Trace element A chemical element found in small quantities (less than 1 percent) in a mineral or compound.

Turbidity The quality of opaqueness due to the presence of suspended material. It is commonly expressed in Jackson Turbidity Units (JTU). These units are roughly proportional to milligrams per liter of suspended sediment: A range in JTU of 3 to 440 corresponds to a range in concentration of suspended sediment of about 5 to 1000.

Variable A quantity that may assume any one of a set of values.

Wastewater Water that has been degraded to the extent that it cannot be recycled for further in-plant use.

Water bar (for erosion control) A small earthen berm constructed to divert and impede the flow of water over erodable soils.

Weir A dam in a waterway over which water flows, serving to regulate water level or measure flow.

ABBREVIATIONS

ac	acre
ac-ft	acre-foot
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
AQCR	Air Quality Control Region
AUM	animal unit month
BACT	best available control technology
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
Btu	British thermal unit
CCNHP	Chaco Culture National Historical Park
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	carbon dioxide
cfs	cubic feet per second
dB(A)	decibels on the A-weighted scale
EA	Environmental Assessment
EHV	extra-high voltage
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FBC	fluidized-bed combustion
FC-A-P	Four Corners-Ambrosia-Pajarito transmission line
FGD	flue gas desulfurization
FLMPA	Federal Land Policy Management Act
FS	U.S. Forest Service
ft	foot
FY	fiscal year
g	acceleration due to gravity
gal	gallon
gpd	gallons per day
gpm	gallons per minute
GWh	gigawatthour
Hg	mercury
hr	hour
ICC	Interstate Commerce Commission
ID	inside diameter
km	kilometer
kV	kilovolt
kWh	kilowatthour
l	liter
lb	pound
m	meter
MFP	Management Framework Plan
mg	milligram
$\mu g/m^3$	microgram per cubic meter
mg/l	milligram per liter
MHD	magnetohydrodynamics

mi	mile
mm	millimeter
MP	milepost
MW	megawatt
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NIIP	Navajo Indian Irrigation Project
NM	New Mexico
NMEID	New Mexico Environmental Improvement Division
NMGS	New Mexico Generating Station
NMPSC	New Mexico Public Service Commission
NMSHD	New Mexico State Highway Department
NMSO	New Mexico State Office
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NSPS	New Source Performance Standards
OD	outside diameter
PL	public law
PNM	Public Service Company of New Mexico
PRLA	Preference Right Lease Application
PSD	Prevention of Significant Deterioration
R	range
RARE	Roadless Area Review and Evaluation
ROW	rights-of-way
SCS	U.S. Soil Conservation Service
SHPO	State Historic Preservation Officer
SJBAP	San Juan Basin Action Plan
SO_2	sulfur dioxide
USC	U.S. Code
t	ton
T	township
t/d	tons per day
TDS	total dissolved solids
TSP	total suspended particulates
USGS	U.S. Geological Survey
WSA	Wilderness Study Area
yr	year
$>$	greater than
$<$	less than
$\sim$	approximately
μ	micro- (millionth)
°C	degree Celsius (centigrade)
°F	degree Fahrenheit
'	foot
"	inch
10^6	million (mega-)
10^9	billion (giga-)

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Appendix A

CONSIDERATION OF ALTERNATIVES

In accordance with regulations promulgated by the Council on Environmental Quality Regulations (40 CFR 1500-1508), the Bureau of Land Management has a responsibility to "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." Alternatives considered must be practical or feasible from both the technical and the economic standpoint. The no-action alternative, a case in which NMGS would not be built, and the possible consequences of it are also considered.

The no-action alternative and its consequences were considered separately from project component alternatives. Project component alternatives are those which consider routes, methods of construction, or means of environmental protection that differ from the Proposed Action. In examining the possible consequences of the no-action alternative, alternatives are defined as those which may have to be considered by the applicant if NMGS is not constructed.

POSSIBLE CONSEQUENCES OF THE NO-ACTION ALTERNATIVE

The process used to identify alternatives for analysis is summarized below and is discussed in detail in the technical report on Alternatives to the Project.

First, potential energy options were identified by reviewing a variety of sources. All specific options identified in the scoping analysis and public involvement summary were included. The options, and the source for each, are shown in Table A-1. These potential energy options were screened to ensure they were:

- In accord with national energy policy.
- Technically feasible.
- Capable of meeting a significant portion of the electric need PNM proposes to meet with NMGS. The criterion used was that an option had to be able to supply or eliminate the need for at least 5 percent of the yearly energy NMGS would supply.

The options that passed this screen are shown in Table A-2.

From these options, six potentially viable alternatives were identified as possibly being considered by the applicant if the no-action alternative is selected:

- Decentralized steam electric
- Coal conversion plus generation
- Geothermal plant
- Nuclear plant
- Out-of-state power source
- Conservation and renewable resource alternative, including some combination of conservation, large hydroelectric, central-station solar-thermal electric and photovoltaic, decentralized photovoltaic, point-of-use solar heating, central-station wind, agricultural and forestry wastes, and wood-fired generation. Energy storage might be required with this alternative.

The environmental issues associated with these are discussed below.

Decentralized Steam Electric

For a decentralized coal-fired steam electric system, the local environmental effects around each plant site would be less than for NMGS since each individ-

Table A-1. POTENTIAL ENERGY OPTIONS

Category	Potential Energy Option	AWV	CEC	CPUC	PNM	Scope	Other
Coal	Central-station steam electric (NMGS)	x	x	x	x		
	Decentralized steam electric	x					
	Retrofit of existing oil/gas units	x	x		x	x	
	Coal conversion plus generation	x	x	x	x	x	
Oil/Gas	Steam turbine		x		x		
	Combustion turbine		x	x	x		
	Combined cycle		x	x	x		
Geothermal	Dry steam		x	x			
	Geopressured			x			
	Hot water		x	x	x		x
	Hot dry rock			x			
Hydro-electric	Large (>25 MW)	x	x		x	x	
	Small (including low-head)	x	x	x	x	x	x
Direct Solar	Central-station thermal-electric		x	x	x	x	x
	Solar-thermal repowering of existing units			x	x		
	Central-station photovoltaic		x	x	x	x	x
	Decentralized ("rooftop") photovoltaic		x	x	x	x	x
	Point-of-use solar heating			x		x	
	Solar-power satellite	x					
	Solar ponds	x	x				
Wind	Central-station ("windfarm")		x	x	x	x	x
	Decentralized ("backyard")		x	x		x	
Biomass	Municipal solid waste		x	x	x	x	
	Agricultural and forestry wastes		x	x	x	x	
	Wood			x		x	
	Nonwood energy crops		x			x	
Nuclear	Water-cooled fission reactor	x	x	x	x		x
	High-temperature gas-cooled fission				x		
	Breeder fission				x		
	Fusion				x		
Out-of-State	Purchase contract	x	x	x	x	x	
	Equity participation	x					
Non-generation	Conservation • Rate structure • Volunteer (assistance/information) • Mandatory (legislative/regulatory)	x	x	x	x	x	x
	Load management • Rate structure • Direct control at point of use			x	x		
Miscel-laneous	Cogeneration		x	x	x	x	x
	Fuel cells		x	x	x		

Sources:

AWV Bureau of Land Management, "Allen-Warner Valley Energy System Environmental Impact Statement," November 1980.

CEC California Energy Commission, "Electricity Tomorrow, 1981 Final Report to the Governor and the Legislature," January 1981.

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Table A-2. ENERGY ALTERNATIVES TO NMGS RETAINED AFTER SCREENING

Category	Candidate Alternative
Biomass	• Agricultural and forestry wastes • Wood
Coal	• Central-station steam electric (NMGS) • Decentralized steam electric • Coal conversion plus generation
Direct Solar	• Central-station thermal electric • Central-station photovoltaic • Decentralized photovoltaic • Point-of-use solar heating
Geothermal	• Hot water (high-temperature liquid-dominated)
Hydroelectric	• Large (central-station)
Nongeneration	• Conservation
Nuclear	• Water-cooled fission reactor
Out-of-State Power Source	• Purchase contract • Equity participation
Wind	• Central-station
Miscellaneous	• Fuel cells

ual power plant in the system would be smaller than NMGS. However, the overall cumulative environmental loading for the whole system should be at least comparable to that for NMGS, since the total electric energy generated would be similar. In addition, each plant would require individual corridors for coal delivery, electric transmission, and possibly water supply. The required multiple corridors would be likely to have more impacts than the smaller number of corridors associated with the centralized NMGS.

Coal Conversion Plus Generation

The environmental effects in the vicinity of a coal conversion plus generation facility would be more pronounced than for a conventional coal-fired steam electric plant. The primary concern is the safe disposal of the large quantities of solid wastes that would be produced. Trace elements and trace organics in the ash or sludge might be toxic or carcinogenic. In addition, air pollution issues include the following: siting with regard to prevention of significant deterioration, nonattainment, characterization of discharges and control of their ecological and health impacts, and possible acid precipitation effects. Treatment of liquid waste is also an important issue. Construction of a coal conversion plant would probably require a larger construction and operating work force than would NMGS; thus the social and economic effects on the surrounding region would be more intense.

Geothermal Power

Major environmental issues associated with geothermal power are airborne emissions, solid wastes, brine disposal, ground subsidence, water use, and hydrologic changes. Other issues include noise, chemical or thermal pollution of surface and ground waters, increased land and ecosystem disturbance (e.g., erosion, sedimentation), and short-term climate disturbances. The environmental effects are highly site-dependent.

Nuclear Power

Nuclear power plants produce radioactive isotopes that may escape into the reactor cooling system. Also, structural and other materials become radioactive during reactor operation, and liquid radioactive wastes are produced. Small quantities of short-lived radioactive gases and airborne particulates are released.

Decommissioning of a nuclear power plant must be done in a way that protects public health and safety. Spent fuel from a reactor is highly radioactive and requires shielding and permanent isolation from the human environment. The safety of nuclear power plants during an accident is a public concern. Land disturbance associated with fuel supply would be much less than for coal-fired generation.

Out-of-State Power Source

Potential out-of-state sources of electricity are likely to be either coal-fired or nuclear power plants. In the absence of unusual local situations, the environmental effects should be similar to those for plants located in New Mexico.

Conservation and Renewable Resource Alternative

This would involve use of a combination of conservation, large hydroelectric, central-station solar-thermal electric or photovoltaic, decentralized photovoltaic, point-of-use solar heating, central-station wind, agricultural and forestry wastes, and wood-fired generation. Hydroelectric environmental issues include passage of fish around dams, water-level fluctuations and downstream flow changes, water quality, and dredging. The reservoir behind a dam would destroy the resources, ecosystems, and human uses of land in the area inundated. Central-station solar systems require large land areas with potential for land use conflicts and disturbance of local ecosystems. Central-station wind plant issues include safety, electromagnetic interference, noise, asethetic, and land use problems. Agricultural and forestry waste environmental issues include erosion due to removal of wastes that would otherwise hold the soil in place, airborne pollutants, and waste disposal. Environmental issues associated with wood-fired generation are similar to those for agricultural and forestry

wastes. Environmental issues associated with conservation, decentralized photovoltaic, and point-of-use solar heating are minor.

ALTERNATIVES TO PROJECT COMPONENTS

Alternatives eliminated from detailed analysis and the basis for their elimination are discussed below.

Coal Supply

Coal from outside the San Juan Basin would cost significantly more to deliver to the proposed plant site than San Juan Basin coal because of mining and transportation costs.

NO_x Control

Low-NO_x Burner/Furnace Design and Flue Gas Treatment for NO_x Control. These options were not considered for detailed analysis because they are in an early development stage and are technically unproven.

Solid Waste Disposal

Marketing of Fly Ash for Commercial Products. At the present time, it is not known whether a commercial market might develop, where it would be located, or how the fly ash would be transported to the market.

Random Dumping of Fly Ash and Scrubber By-Products. This alternative was eliminated because the fly ash and scrubber by-products would be dispersed throughout mine overburden and would therefore be inaccessible for resource recovery or mitigation of potential impacts.

Off-Site or On-Site Landfill. In addition to excessive cost, there would not be a sufficiently suitable area within the plant site boundaries, and other lands outside the potential coal mine areas are not available to the applicant.

Heat Rejection System

Once-Through Cooling. The large amounts of water required and the capital and operating costs for necessary facilities would not be economically reasonable.

Cooling Ponds. Larger land areas would be required, larger water losses due to evaporation would occur, surface and subsurface hydrology could be affected by seepage, suitable geologic formations for impoundment are unavailable, and costs would be significantly greater than for other available cooling systems.

Natural-Draft Cooling Towers. This system would not be technically feasible because the high temperature and low humidity of ambient air would not create the necessary natural draft effect, towers (up to 600 feet) and plumes would be highly visible, and capital costs would be high.

Dry Mechanical-Draft Towers. Overall plant efficiency would be reduced because turbines must operate against high condenser back pressure. Installed costs for dry mechanical-draft cooling towers could be as much as 20 times the cost of wet mechanical-draft cooling towers. Land area requirements for dry mechanical draft cooling towers would be greater than for wet mechanical-draft cooling towers.

Water Supply System

Uranium Mine Dewatering. Reasons for elimination of this potential water source include:

- Availability of water would be uncertain because of current inactivity in the uranium industry.
- Production would not be within the control of the applicant.
- Policies with respect to rights and uses for such water are in an emergent stage.

Appendix B

DETAILED DESCRIPTION OF SYSTEMS, FACILITIES, AND PROCEDURES

The following summary descriptions are from the Project Description Technical Report.

PLANT FACILITIES

Power Plant Construction Sequence

There would be no clear demarcation in the sequence between one group of plant construction activities and another. It is expected that about 60 months would elapse from the time site clearing started in 1985 until the first generating unit was ready for commercial operation. The total construction time required for all four units would be approximately 13 years (1985-1998).

Station Layout and Site Preparation

The proposed arrangement of power plant facilities is shown on Figure 1-2 in NMGS Chapter 1. Most of the structures would be enclosed by corrugated metal panels, painted rawhide color with buckskin-colored trim. Exposed structural steel surrounding the boiler structure, particulate removal system, and sulfur dioxide (SO_2) removal system would be painted the same rawhide color. Exposed paint-receptive surfaces of storage tanks, coal-handling conveyors, cooling towers, and plant support structures would be finished to match the main power block. The main power block would consist of four units, each arranged in a series of rectangular buildings varying in height from approximately 100 feet at the turbine generator area to approximately 240 feet in the boiler area. The chimney stacks may be as high as 575 feet. From south to north, each generating unit would include the turbine generator area, coal pulverizer area, boiler area, particulate removal system, SO_2 removal system, and chimney stack.

Preliminary plans would be to step-grade the plant area and preserve existing contours to the maximum practical extent to avoid excessive cut-and-fill operations. During construction, erosion control would consist of drainage ditches across disturbed areas that would tie into the existing surface drainage features. Siltation control measures would include sedimentation ponds, sediment traps, and controlled drainage slopes. Plant construction laydown areas would be located within a 1-mile radius of the plant.

All spoil (material unacceptable for structural fill) would be hauled to on-site areas not required for the plant, spread to blend with the natural topography, and shaped to control erosion from drainage. Topsoil would be removed and stockpiled by construction equipment prior to required excavations. The piles would be shaped and graded for drainage and erosion control. Topsoil would be reused in revegetating spoil disposal and disturbed areas.

Water sprayed from tank trucks would be used as a dust suppressant on unpaved roads during construction. Some roads would not be paved until near the end of major construction phases in order to prevent unnecessary damage to pavement from the construction operations. All disturbed nonroad areas not covered with asphalt, concrete, or gravel would be reseeded with native grasses or shrubs for erosion and dust control.

The entire site would be fenced at the beginning of construction to provide adequate security for contractors' equipment, plant materials and equipment, and overall station security requirements.

Steam Electric System

The Proposed Action is to purchase and install conventional turbine generators as produced by any of several manufacturers. The turbine generators would have a nominal rating of 500 MW. They would be capable of providing a gross output of about 550 MW, with about 50 MW required for the plant operations.

Fuel Supply System

Identification of Primary and Secondary Fuels. The NMGS would require two types of fuel for efficient, reliable operation: the proposed primary fuel would be San Juan Basin subbituminous coal; residual fuel oil produced in New Mexico is the expected secondary fuel. The choice of a secondary fuel would be based on economics (including costs for environmental compliance) and availability. Subbituminous coal would be used in the steam generation system supplying steam to the turbine generator and plant ancillary systems. Residual fuel oil would be used to produce steam for the plant auxiliary steam system during plant startup and maintenance intervals. Diesel fuel oil (No. 2) is expected to be used only as a fuel for the emergency diesel generators. Auxiliary steam would provide station heating, deaerator pegging steam, steam coil air heater requirements, main steam generator ignitor oil supply, and condenser air ejectors.

Fuel Consumption and Supply. NMGS coal consumption for four 500-MW units (assuming coal heat content of 8300 Btu/lb) would average about 7.5 million tons per year and 300 million tons over a 40-year plant life, based on project estimates for station heat rate, gross output, and average unit capacity factors (65 percent) over the life of the station. Annual and total fuel oil consumption would be a function of the the number of units on-line and boiler design. Average annual fuel consumption with four units on-line would be approximately 180,000 barrels of oil. Total fuel oil consumption over the life of the plant would be approximately 7.2 million barrels. Fuel oil supplies have not yet been contracted; delivery would probably be by truck or tank car.

Secondary fuel would be stored in tanks at the site and would be loaded from truck or train unloading stations. Unloading stations would be designed to collect any inadvertent oil spills in sumps. Spilled oil would be transferred to holding tanks for oily wastes, which would be included in the water management system. These wastes would be trucked off-site to a contracted disposal firm for final disposition.

Diesel fuel would be used during station construction for on-site equipment and transportation at the rate of approximately 250,000 gallons per year (gal/yr). It would not be used as a boiler startup fuel. Gasoline would be consumed in normal vehicle use during station construction at the rate of approximately 25,000 gal/yr. All diesel fuel and gasoline for construction equipment would be stored on the site in elevated or buried storage tanks. Off-site fuel use would be dependent on sources and methods of transportation to the site and is currently undetermined.

Fugitive Dust Control

Fugitive dust emissions from conveyors, crushers, and other coal processing areas would be controlled using proven techniques. The estimated fugitive emissions and emission control effectiveness for the various coal-handling and processing steps are summarized in the Air Quality Technical Report.

Emission Control Systems

All emission control systems would be designed to meet applicable federal and state regulations. Details of these systems can be found in the Project Description Technical Report.

Particulate Removal System. Two particulate control systems were evaluated for use at the proposed NMGS (i.e., fabric filter; electro-static precipitator, both hot-side and cold-side types). These two systems were selected for detailed analysis because they would be capable of removing particulate matter at high efficiencies and would meet applicable federal and state regulations for particulates. Fly ash would be collected in hoppers with a design storage capacity that would prevent ash from reducing the efficiency of the particulate removal system, regardless of the system chosen.

Sulfur Dioxide Removal System. The two SO_2 control systems selected for detailed analysis (i.e., wet limestone scrubbing; alkali spray-drying) would be designed to achieve a peak SO_2 removal efficiency of 85 percent, based on the worst-case Bisti coal analysis. These SO_2 control systems would be capable of consistently attaining an average SO removal efficiency of 80 percent, if required to meet New Mexico state emission limits.

Nitrogen Oxides Control System. Any one of three alternative control techniques is capable of meeting the current New Mexico NO_x standards (dual-register burner; tangentially fired steam generator; controlled-flow/split flame burner). Total NO_x emissions would be 35,000 tons per year, assuming that minimum New Mexico NO_x standards are met.

Stacks

The stack height for each NMGS unit would be in the range of 400 to 575 feet. These heights are based on EPA's draft of the proposed revisions to 40 CFR, Part 51, to implement Section 123 of the 1977 Clean Air Act Amendments. The nearly level topography in the plant vicinity would not cause downwash problems. The stack exit diameter would be approximately 30 feet. Construction materials would probably be concrete with brick lining. One stack would be required for each of the four units. The planned distance between stacks is about 400 feet. The stack lighting system would conform to FAA requirements.

Other Emissions

The primary function of the auxiliary boiler would be to provide steam during plant startup operations. The boiler would probably be used twice a year for 2- to 4-week periods during scheduled maintenance. For the rest of the year, auxiliary steam would be supplied from the main unit boilers. The auxiliary boiler would comply with federal and state emission limitations for auxiliary boilers fired with No. 6 fuel oil; it would consume approximately 5350 lb/hr. Preliminary estimates of fuel oil consumption after startup total approximately 2.2 million gal/yr for each 500-MW unit.

A diesel generator would be required to supply electric power in an emergency. The unit size would probably be between 800 and 1000 kW. The unit would run on diesel oil supplied from the unit's day tank.

Disposal of Plant-Generated Wastes

Construction and operation of the NMGS would result in the production of several kinds of solid and liquid wastes. The wastes and their characteristics can be only broadly categorized at this time; detailed descriptions must await final project design. An important objective in the design of the NMGS is that there would be no transport of wastewater beyond the boundaries of the waste disposal facilities (zero discharge). If a zero discharge system cannot be maintained, NPDES permits would be obtained to allow discharge of effluents beyond plant boundaries. All solid and liquid waste disposal facilities would be in the general vicinity of the plant. Mined-out pits from the coal mining operation would be used for solid waste disposal to the maximum practical extent.

Water Management and Water Treatment

The applicant plans that the water management system would operate, under nonupset conditions, without discharge to any off-site channel or receiving water body, and without significant percolation or seepage to ground water. An NPDES discharge permit would be applied for if required. The NMGS water management system would be designed and operated to reuse, reclaim, and recycle water to the maximum practical extent, including reuse in progressively less demanding parts of the system. Several water treatment systems and processes would be incorporated in the water management system to provide water of acceptable quality for the various in-plant needs. Used water, degraded to the extent that it could not be economically treated for further in-plant use, would be used for transport and disposal of plant-generated wastes or would be discharged into evaporation ponds (Water Quality Technical Report).

Flow in the several intermittent drainage channels that presently cross the plant site boundaries would be diverted around the plant area; thus the

runoff would not be affected by plant activities or emissions. The plant site area would be graded, shaped, and surfaced to facilitate control and collection of contaminated runoff from on-site precipitation from a 10-year 24-hour storm and possible liquid spills. Spills and plant site runoff that may be contaminated would be collected in drainage basins; noncontaminated runoff would not be collected.

The major plant water use would be in the heat rejection system, which would discharge large volumes of water into the atmosphere by evaporation from the cooling towers. Makeup water for this system, from either the San Juan River source or ground water, would be treated by lime or lime-soda softening and pH adjustment to control scaling and corrosion before introduction into the system. In addition, the water in the system probably would be chlorinated or ozonated as required to control biological fouling of the tower and algae growths in the basins beneath the towers. Blowdown from the system would be used in the plant flue gas desulfurization system and for ash transport or wetting.

The water treatment processes would yield several waste products, including sludges and concentrated solutions. These wastes would be used for wetting fly ash and then disposed of in the mine. Liquid wastes unsuitable for placement in the mine with ash would be disposed of in on-site evaporation ponds.

Solid Waste Disposal

Four types of wastes would be derived from coal used in NMGS: bottom ash, fly ash (including economizer ash), coal pulverizer rejects, and flue gas desulfurization (FGD) byproduct. Bottom ash and pulverizer rejects would be combined when removed from the system. The FGD by-product could be either dry particulate matter or a water-based slurry, depending on the selected desulfurization process. If the FGD by-product were in particulate form, it would be removed from the flue gas in combination with the fly ash; in slurry form, it would be removed separately from the fly ash.

On a quantitative basis, the most significant wastes associated with NMGS would result from the coal burning process, including coal preparation (pulverizing) and desulfurization of the combustion gases. On a volumetric basis, the estimated average production of coal-derived wastes would be about 1475 acre-feet per year with four units operating, or 59,000 acre-feet over a 40-year plant life. Other project-related wastes would be derived from the various water treatment processes required for operations; sanitary wastes derived from support of the project construction, operating, and maintenance staffs; and plant construction wastes.

Ash Disposal.

Fly Ash and Scrubber By-Product. The Proposed Action includes combining fly ash with FGD by-product prior to disposal. If a wet limestone FGD process were selected, the slurry from the FGD system would be dewatered before being mechanically mixed with fly ash. If an alkali spray-drying FGD process were selected, fly ash and FGD by-products would be collected simultaneously in the particulate control system and the combined material would be wetted in a mechanical mixer.

The wet material would be hauled by end-dump truck to previously mined portions of the coal mine. Disposal areas would be prepared for receiving ash by first backfilling with mine overburden material to a depth of 20 to 60 feet, depending on the volume of overburden requiring disposal. Present expectations are that several layers of ash would be placed, to an ultimate thickness of 40 to 60 feet. After the ash was placed and spread to the final disposal depth, it would be covered with random overburden from the mining operations to a depth of 4 to 8 feet and approximately 12 inches of select overburden (top dressing). The final surface of the disposal area would be shaped and gently sloped to permit drainage without erosion. Reclamation of disposal areas would consist of establishing a vegetative cover in accordance with reclamation requirements that would be specified by the Office of Surface Mining for individual mining plans. Revegetation would be accomplished by seeding, with selected native species, at the appropriate season and irrigating or reseeding as required until a satisfactory ground cover was established. Although the quantity of water to be used for

irrigation cannot be specified at this time, it could be substantial.

The Proposed Action would result in the fly ash being concentrated within relatively small areas and not mixed with materials other than the FGD by-product. Therefore future recovery of the material might be feasible if economic conditions made it worthwhile for resource recovery, or if for any reason environmental effects of the disposal were no longer satisfactory.

Bottom Ash and Pulverizer Reject Disposal. A dewatered slurry of bottom ash and pulverizer rejects would be discharged into end-dump trucks for hauling to the disposal area. Disposal would be into previously mined portions of the coal mine, probably contiguous to the fly ash disposal areas. The procedures for disposal would be the same as described above for fly ash, in case at some time it was necessary or desirable to have access to the materials.

Sanitary Waste

The sanitary sewage treatment system would consist of two treatment plants capable of handling the waste of an aggregate population of 1000 individuals. One sewage treatment plant would be constructed for Units 1 and 2, and a second plant would be installed when Units 3 and 4 are constructed. Each sewage plant would be sized to handle an estimated 30,000 gallons per day.

The effluent from sewage treatment would be delivered to the water management system for reuse within the generating complex. During the construction period, portable chemical toilets would provide sanitary facilities for the construction labor force.

WATER SUPPLY SYSTEM

Water Supply Pipelines

Prior to initiating construction-related activities, the ROW would be acquired from private landowners. Owners and tenants of private land and lessees and developers of public lands near the ROW would be notified in advance of construction activities that could affect their property, business, or operations. A preconstruction plan (Plan of Operation) would be developed for BLM lands.

Construction, operation, and maintenance of the following proposed main wawater pipelines project components were considered in the environmental analysis. Map 1-1 in NMGS Chapter 1 shows the general location of the proposed main water pipelines. The proposed main water pipelines would consist of the following six elements:

- One electric-motor-driven pumping plant (manned) at the intake site with an ultimate capacity of about 35,000 acre-feet of water per year.
- Approximately 1 mile of 48-inch outside diameter (OD) main water pipeline (steel) from the intake pumping plant to the first booster pump station.
- Initially, approximately 39 miles of 42-inch outside diameter (OD) main water pipeline, between the first booster pump station and the terminal storage reservoir near NMGS.
- Three automatic electric-motor-driven pump stations (unmanned) between the intake pumping plant and the pipeline high point near Moncisco Mesa.
- Approximately 20 blowoff valves installed along each of the proposed main water pipelines to discharge sediment that might collect at low points during certain flow conditions and to drain the lines for inspection or repair.
- Cathodic equipment as required to protect existing or future oil and gas lines in the vicinities of the intake pumping plant and booster pump stations.

New access roads are not proposed for construction or operation of the main water pipelines and associated facilities. Existing roads would be improved where continuous access is required, such as to the intake pumping plant. Existing roads (e.g., new and old NM 371) or the pipeline ROW would be used for surface travel. Roads used would be maintained during and rehabilitated after construction.

Construction Methods. The applicant proposes to acquire approximately 35 acres on the floodplain of the San Juan River for siting of the intake pumping plant and river diversion facilities. Construction of the intake pumping plant

would require excavation to as much as 20 feet below the existing ground level. Excavated materials would probably be hauled by truck to a convenient on-site stockpile area or be used for construction of a protective dike. After all four pump units were constructed, the dimensions of the intake pumping plant would be 48 feet by 130 feet. The plant site would be surrounded by a dike, or the entire site area would be filled and raised above the 100-year flood level, prior to construction of the intake pumping plant.

Pipeline construction activities would normally be confined to a 90-foot ROW. Only that portion of the ROW needed for construction would be cleared. Typical construction activities require clearing aboveground vegetation and obstacles from an average 30-foot width of the ROW to allow safe and efficient operation of the construction equipment. Blading of the ROW would not be done unless necessary for the movement of machinery and equipment or for the ditching required for the installation of pipe (for instance, it is sometimes necessary to blade in areas with steep side slopes). In some areas of rough terrain, a 60-foot ROW clearance would be the minimum necessary for safe and efficient construction. Due to terrain or proximity of existing utilities, there would be some areas for which more than 90 feet would be needed, but in no instance would temporary use of more than 120 feet be required. In these cases, it is possible that a temporary use permit would be needed for as much as a 120-foot construction ROW.

To permit safe vehicle operation, it may be necessary to con-struct temporary bridges or culverts across washes and arroyos on the working side of the ROW. No major rivers or perennial streams would be crossed by the proposed main water pipelines. Wash and arroyo crossing points would be carefully selected to reduce disturbance of wash beds and arroyo banks.

Temporary storage areas required during pipeline construction for equipment, pipe, and other materials would be acquired through private permission or temporary use permits. Generally, these areas would not be on or adjacent to the ROW. Where fences were encountered along the ROW, adequate bracing would be installed at each edge of the ROW prior to cutting the wires and installing temporary gates, whose opening would be controlled.

Once the ROW had been prepared, stringing, welding, and trenching operations would begin. A trench, no more than 15 feet wide and approximately 10 feet deep, would be centered on a line about 30 feet from one edge of the ROW. Construction activities would proceed with special precautions to prevent damage to buried utilities. Generally, trenching operations would employ backhoes or draglines; however, subsurface conditions may require different types of excavating equipment. Blasting would be used only when necessary. Normally, the effects of the blasting would be confined to the ROW. Where blasting was necessary, all required safety precautions would be taken.

Generally, intermittent watercourses (washes/arroyos) would not be crossed during periods of periodic high flow (e.g., late summer). Construction of crossings would generally be accomplished within 14 days. Streambed reconstruction would be consistent with Corps of Engineers requirements for 404 permits (33 USC 1344). Every effort would be made to minimize the potential effects of construction on water flow. The stream gradient would be restored upon completion of construction, stream banks would be restored to resemble their original grade, and breakers or riprap would be placed over the pipeline along banks where necessary for erosion control.

Crossings of NM 371 would be done by open trench methods, unless final design studies show that tunneling under the highway by jacking casing pipe is feasible. If pipeline construction was by open trench, both the initial and second main water pipelines would be installed under the highway during initial construction. Unimproved roads would be trenched and restored.

Stringing, trenching, lowering, joining, grouting, backfilling, and cleanup are the main steps that would follow ROW preparation. The pipe would be strung along the ROW prior to or during trenching operations. A temporary pipeline laid on the surface near the ROW boundary would be used to convey about 5 acre-feet of water along the work site for

construction use. Water would be pumped from the San Juan River, one of the irrigation canals crossed, and nearby wells as appropriate. Existing livestock water ponds would be used for storing water from the construction water line through arrangements made with the owners for such use. The water would be used for purposes such as dust suppression on roads, conditioning materials for compacted or consolidated backfill, and hydrostatic testing of the pipeline.

The three proposed intermediate pump stations would be essentially identical (except for power ratings, etc.). The main water pipeline and ROW would be shifted away from the highway on each end of the intermediate pump station sites to enable these sites to abut the highway. During construction, 2 additional acres of land outside of the permanent ROW would be temporarily required for office, tool, and equipment storage areas.

Materials from trench excavation, particularly the dune sand, between MP 3.5 and 30.5 of the proposed main water pipeline, would be suitable for all backfill requirements of pipeline construction. Materials for backfill around structures and for embankment work at the intake works and pumping plant would come from excavation required for the structures and from a proposed borrow area downstream of and adjacent to the proposed intake plant site. Materials for use in concrete manufacture would come from commercial sources in the Farmington area.

Completed construction areas (including the ROW) and access roads no longer required would be returned as nearly as practicable to original condition or to that agreed upon by the applicant and the landowners or the authorized officer. Restoration of areas disturbed by intake pumping plant, pipeline, and intermediate pump station construction would be accomplished by whatever means is most suitable for the soils, terrain, climatic conditions, and surrounding vegetation.

Erosion control, as necessary, would be employed on sloping areas (>4 percent slope) along the main water pipeline ROW and along any cuts made through unconsolidated materials. All reasonable means would be undertaken to control erosion and soil damage resulting from construction, rehabilitation, or maintenance and operation, including (but not limited to) construction of terraces, water bars, or other structures. During routine aerial reconnaissance, the applicant would monitor the success of erosion control and revegetation in accordance with the BLM monitoring plan, which would be a condition of the ROW grant.

Special Construction Practices. The applicant would undertake a number of construction and restoration practices in addition to those already mentioned. The resource considerations outlined below are intended to reduce environmental impacts. These practices would be incorporated as stipulations to a ROW grant.

During construction, operation, maintenance, and termination of the project, the applicant would perform all activities in accordance with applicable air and water quality standards, related facility siting standards, and related plans for implementation. Pesticides would not be used during construction or operation of these pipelines. An EPA-approved herbicide would be used within the fences at the pump stations to prevent weed fires, and around safety signs within the ROW so they remain visible. Adequate warning signs would be positioned far enough ahead of construction zones so that drivers would have sufficient warning to decelerate safely. Signs would be positioned in accordance with relevant regulations.

Construction of the proposed main water pipeline may occur during months when recreation use is high. The work force would not use public campgrounds for temporary housing.

Prior to initiating any ground disturbance, the applicant would take actions to protect cultural resources in accordance with agreements currently being developed between the BLM, the Advisory Council on Historic Preservation, and the State Historic Preservation Officer in New Mexico. The applicant would make a concerted effort to protect the scenic values in the area of construction and the adjacent land. For example, all aboveground improvements and barricades would be nonreflective. When a safety color is not required, the color used would be chosen to blend with the natural background for that location. The proposed main water pipelines would not be located within a Wilderness Study Area

(or RARE II Area) boundary and would not come closer to a boundary than an already existing road or trail. Where the ROW includes public lands on which cadastral survey monuments and markers are located, the applicant would avoid disturbance or removal of such monuments and markers. If the removal of monuments or markers becomes necessary during specific construction activities, the applicant would advise the appropriate agency of that need. Removal and relocation would then be done in accordance with detailed instructions set forth by the appropriate agency.

The applicant would perform, at its own expense, any required monitoring, modifications, or additional reclamation work needed to comply with the terms and conditions of the ROW grant.

Operation and Maintenance. The applicant would conduct aerial patrols to inspect the ROW at least every 2 weeks to determine the integrity of the pipeline and the success of surface-disturbance mitigation measures. Surface traffic would be limited to periodic valve inspections, ROW maintenance, and emergency pipeline repairs. The intermediate pump stations would be inspected daily by a two-person crew from NMGS. The pipeline pressures, pump performances, and status information of the system would be telecommunicated from the booster plants to the intake plant and would be monitored and recorded by instruments and supervisory personnel 24 hours per day.

Reservoir

Preliminary planning indicates that the active storage capacity of the reservoir should be about 4000 acre-feet. This quantity would be adequate for supplying the power plant needs for approximately 5 weeks at ultimate development (four 500-MW units). A gross capacity of about 5000 acre-feet would be provided to allow for sediment deposition in the reservoir and dead storage below the minimum reservoir operating level. The full reservoir water level would be approximately elevation 6135 feet; the minimum operating level would be about elevation 6100 feet. The reservoir would be sufficiently higher in elevation than the power plant so that the power plant could be supplied by gravity flow throughout the full range of reservoir operating conditions. The water surface area of the reservoir, when full, would be approximately 145 acres.

The reservoir design and operation would be essentially the same whether the project water supply was obtained from the San Juan River or a well field located in the power plant vicinity, or a combination of those sources. Because there may be suspended solids in the water, particularly if the supply is from the San Juan River, present plans are to provide separate pipelines to deliver water to the reservoir and to transfer water from the reservoir to the power plant. The reservoir inlet and outlet structures would be separated from each other to the maximum practical extent, to facilitate sediment deposition in the reservoir. The reservoir would be contained by a dike, or embankment, extending about 70 percent around the reservoir perimeter. To the maximum practical extent, the embankment would be constructed using materials available within the reservoir area. A program would be implemented to establish a vegetative cover on the exterior slope of the embankment. A fence would be erected around the entire perimeter of the reservoir. Access to the reservoir would be provided from the new NM 371, which would cross the extreme northeastern corner of the section in which the reservoir would be constructed (see Map 1-3 in NMGS Chapter 1).

Special materials that may be needed in constructing the embank-ment would come from outside sources. The types of special materials and their potential sources would be determined during design of the project. Borrow area(s) outside the reservoir, if required, would be prepared by first removing and stockpiling topsoil. After materials for construction were removed, these borrow area(s) would be graded to satisfactory, stable slopes with proper drainage and would be revegetated. The BLM and local agencies would be consulted to formulate restoration plans.

TRANSMISSION SYSTEM

NMGS Switching Station

The northern terminus of the 500-kV line from NMGS to Rio Puerco Station would be provided by the proposed 500-kV

switching station located about a quarter mile south of NMGS. The switching station would be developed in four phases. The station would be constructed of structural steel, with a maximum tower height of 120 feet. Most of the station would be less than 45 feet in height. The site would be a rectangle approximately 800 by 2200 feet (40.3 acres) and would be surrounded by an 8-foot chain-link fence topped by three strands of barbed wire. Access to the switching station would be from either NM 371 or the Star Lake railroad. A new microwave station would be established at the NMGS switching station.

Rio Puerco Station

The proposed Rio Puerco Station would provide the southeastern terminus of the proposed 500-kV lines. The proposed station (approximately 10 miles northwest of Rio Rancho, New Mexico) would be situated directly northwest of the WW-BA 345-kV tap.

The maximum tower height would be 120 feet, but most of the station would be less than 45 feet in height. Additional descriptions for general visual characteristics are presented in the Visual Resources Technical Report. The site would be a rectangle 2045 by 2325 feet (109.2 acres), with 45.7 acres enclosed by an 8-foot chain-link fence and topped by three strands of barbed wire. Access would be from Rio Rancho, over approximately 10 miles of existing road (20 feet wide), which would be improved by grading.

Existing access to the site is excellent. The graded roads of the Rio Rancho development would require only slight improvements. This site is located adjacent to all of the 345-kV lines that would be connected to the station. Hence, no 345-kV construction would be required. Incremental 500-kV transmission line length would be 8.4 miles. These 500-kV lines would probably be within existing corridors.

Construction Procedures

Rights-of-Way. The ROW width for the 500-kV transmission lines would be 200 feet, which would allow the use of long-span construction and provide some flexibility for structure alignment. This width would ensure that midspan conductor blowout from high winds would not exceed the ROW. Clearances to any existing buildings or structures would be provided in accordance with the National Electric Safety Code (1977 edition).

Construction of transmission lines would generally follow a sequence of ROW clearing, road construction, tower foundation construction, tower assembly and erection, conductor and shield wire stringing and tensioning, and finally, site restoration. However, prior to the actual start of construction procedures, extensive aerial photography and on-the-ground survey work would be completed. The survey work and those operations involved in the typical construction sequence are discussed below. It should be noted that, within the limits set by the applicant, the final choice of exact procedures would be that of the contractor selected by the applicant to construct the transmission line, though the applicant would meet all landowner/ manager restrictions and stipulations.

Large and bulky materials would most likely be delivered by rail. Two or three marshalling yards near the railheads would be required during construction of the project. Staging areas for temporary material and equipment storage would be located about every 30 miles along the transmission line route. Materials would probably be delivered to the construction site by truck.

Construction activities at stream crossings would be planned and supervised by the construction contractor and the applicant's engineering staff on a site-by-site basis, to ensure minimal modification of channel hydraulics and minimal introduction of sediment and contaminants to stream channels. Various types of equipment would be used during construction of the line.

Survey Procedures. The line survey would be accomplished by a combination of ground survey and aerial photography. The ground survey team would establish a basic control network by locating photo-identifiable points on the ground at selected points along the route. Points of intersection, coordinate locations, and the corridor centerline would be determined by the ground survey team.

Boundary and easement identities would be determined from a combination of ground survey and aerial photographs.

Soil Borings. Soil borings would be made at approximately half-mile intervals, or where there are significant changes in the geology, to determine the engineering properties of the soil.

Clearing. The clearing of some natural vegetation would be required; however, selective clearing would be done only when necessary to provide electrical clearance, line reliability, and construction and maintenance operations. Clearing crews would make a minimal number of passes through the ROW, making use of existing access roads as much as possible. Existing cleared areas would be used whenever possible for construction areas, storage areas, etc. Grading and removal of grass cover or low growth would be prohibited unless considered necessary.

Large trees encountered under or near conductors would be topped or removed. This would be done to provide adequate electrical clearance under the lines according to National Electric Safety Code standards, and to improve line reliability by removal of trees that could possibly fall on the line (whether they were in or outside the ROW).

Access Road Construction. The construction of access roads would be required to allow the movement of the various sizes and types of vehicles required for construction of the line. Access roads would be temporary, unpaved construction roads along the ROW, permitting access for workers, materials, and equipment to the ROW (sometimes with approved deviations away from the ROW). Access roads would be closed to public travel and restoration measures applied once construction is completed. Roads with a maximum grade of 7 to 10 percent are desired for safe and efficient construction. Existing roads would be used for construction access when possible. Where necessary, roadside drainage ditches and water bars would be installed to control erosion. Where fences are encountered crossing the route of a temporary road, a temporary gate would be installed, which can be removed at the completion of the project and the fence permanently closed.

The total amount of new access roads required for construction of the proposed facilities is dependent on the ROW surveys. Only after the surveys are completed and exact line alignment and structure sites are located can the number and extent of new access roads be precisely determined. As a result, worst case assumptions were made for the analysis of impacts from new access roads.

Tower Construction, Assembly, and Erection. It is expected that circular cast in-place concrete foundations would be the predominant type for the tower center support; however, other types may be used in certain cases. At locations where the circular concrete foundations could not be installed because of underlying rock formations, rock bolts or rock anchors would be considered. Construction of the foundations for the self-supporting angle structures would be very similar to the construction of the foundation for the center support of the guyed-vee structure. An area approximately 150 by 200 feet would be required at each tower site to provide space for the actual tower installation as well as an assembly and construction area for foundations, anchors, and tower components.

Concrete from existing commercial plants would be delivered in transit-mix trucks to the tower site when possible and economically desirable. In remote areas, the concrete would be supplied from temporary batch plants located at approximately 20-mile intervals (i.e., five batch plants for the proposed and alternative routes). An area of about 2 acres would be required to store cement, gravel, sand, and water and to operate the portable plant.

Ten- to 30-acre marshalling yards for receiving and disbursing materials would be secured adjacent to railroad and major transportation facilities in the Albuquerque area. Smaller staging areas, approximately 5 to 10 acres, would be located about every 30 miles (i.e., three marshalling yards per line) along the ROW to store material and equipment as construction progresses. The lattice tower

members would be bundled by tower units at the marshalling yard and transported by truck to the tower sites.

Grounding. The potential of induced voltages from structures to earth would be maintained at a low value by the installation of a grounding system. The steel structure would be grounded by means of a grounding wire attached to the stub angle, routed below grade, and connected to a grounding rod adjacent to the foundation. A grounding plate buried at the bottom of the foundation excavation may be used as an alternative to the ground rod. In areas where ground rods or plates cannot be installed, a counterpoise would be installed. The application of magnesium sulfate, copper sulfate, sodium chloride, or other chemicals to decrease soil resistivity would be considered only when other grounding methods prove ineffective. Metal fences, gates, buildings, and roofs (on or directly adjacent to the ROW) would be grounded to eliminate possible shock hazard caused by induced voltages.

Conductor Installation. The conductor type and size would be determined from economic and performance studies. Vee-string insulator assemblies with 24 to 26 units in each leg would be used to support the conductor at the tangent towers. Individual lengths of conductor or shield wire would be strung in opposite directions and compression-spliced together to provide approximate 3-mile lengths, which can be tensioned simultaneously. The total disturbed area at a pulling and tensioning site would be about 200 by 50 feet, although no clearing or leveling would be required outside the 20- by 40-foot areas unless vegetation and terrain make it necessary for safety and efficiency.

Shield Wire Installation. Two shield wires would be installed above the three-phase conductor bundles for lightning protection and would be positioned to provide a shielding angle of approximately 10 degrees with respect to the outside phases. Shield wires would be installed in the same manner and at the same time as the conductors.

Cleanup and Site Restoration. Normal cleanup at each site during construction would eliminate most cleanup efforts during the final phase. All waste and scrap materials would be removed from the ROW and deposited in local landfills in compliance with local regulations and in accordance with land owner or manager agreements.

Lands disturbed by heavy equipment or trucks would be restored; deep ruts and holes would be eliminated by filling or grading. Disturbed areas around structure foundations would be graded to approximate the original grade. Any damage to existing bridges, culverts, driveways, or roadways during construction would be repaired by the contractor. Temporary bridges and culverts would be removed from temporary access roads, and the roads would be restored to their natural state by grading original slopes and planting natural cover. Temporary construction roads would be harrowed and reseeded as required, or allowed to return to an original state as specified by the land owner or manager. Soil removed during construction would be replaced, graded, and reseeded to approximate the original conditions.

Maintenance

The applicant would keep the transmission line ROW closed and would patrol the transmission line by helicopter each month. An annual ground patrol would be conducted by a four-wheel-drive vehicle, or by foot where necessary. Should it become necessary to reach a structure for maintenance (such as tightening loose hardware, replacing damaged members, or replacing broken insulators), that structure would be reached either by helicopter or overland from existing access roads. Depending on the maintenance requirements, it may be necessary to use a high-reach line truck and several pickup trucks. If any maintenance required access to a structure on public lands, the appropriate agency would be notified in advance, except for emergencies requiring immediate repair.

Transmission System Cost

The total cost of the proposed 500-kV transmission line can only be estimated by the applicant at this time. Surveying and engineering studies are required to determine the exact centerline and tower locations. Once this is accomplished, accurate costs can be identified.

For the purposes of this EIS, preliminary construction and ROW cost estimates are available and have been used. The total estimated cost of the transmission project is $256,618,458. This estimate includes the following components: first transmission line, $78,775,216; second transmission line, $104,684,401; NMGS switching station, $43,178,965; Rio Puerco Station, $23,338,537; and NMGS-FC-A 500-kV loop, $6,641,339. All of these estimated costs reflect a projected inflation rate of 7 percent calculated through the year of expected completion of each project component.

Appendix C

DESCRIPTION OF BASELINES 1 AND 2

The New Mexico Generating Station is proposed to begin construction in 1985 with the construction period for the four units continuing through 1998. Operation of Unit 1 would begin in 1990. In order to conduct the impact assessment based on a description of the affected environment as it would be during these future times, baseline conditions were estimated into the future. Projects and programs that have a high likelihood of existing in the affected environment by the times of construction and operation of NMGS were identified by the following categories:

- Exist now and will continue
- Are under development
- Are licensed but not under construction (as of September 1, 1981)
- Are under development but not fully licensed
- Are formally proposed and undergoing environmental review

San Juan Basin Action Plan proposals were considered in the cumulative impact assessment, as discussed in Chapter 3.0 and the Draft Cumulative Overview document.

Projects and programs to be included in Baselines 1 and 2 were identified during the scoping process and through subsequent contacts with agency and industry representatives. Baseline 1 consists of projects or programs that exist and are expected to continue, and those that are approved. Baseline 2 consists of Baseline 1 plus projects that are formally applied for and undergoing some phase of permitting process and have a high likelihood of existing during construction or operation of the proposed NMGS project.

Each impact assessment technical report identifies differences in analysis results based on the two baselines or any adaptation of these baselines to a particular analysis. In general, differences in results based on the two baselines were minor.

Tables C-1 through C-6 present information on the Baseline 1 projects that have been identified. Information on Baseline 2 projects is presented in Tables C-7 through C-9. Maps C-1 and C-2 show the locations of the Baseline 1 and 2 projects.

Table C-1. BASELINE 1 POWER PLANTS IN THE SAN JUAN BASIN REGION

						Proposed Time Schedule		
Project Name	Status*	Company	Approximate Location	County	Project	Initial Construction	Initial Production	Abandonment
Four Corners Power Plant	1	Arizona Public Service Company	T29N, R15W	San Juan	Coal-fired power plant	Existing	1970	2000
• Particulate Removal	2				Air pollution cleanup	1980	1980	2000
• SO_2 Removal	2				Air pollution cleanup	1981	1981	2000
Plains Escalante Generating Station	2	Plains Electric Generation and Transmission Co-op., Inc.	T14N, R12W	McKinley	Coal-fired power plant	1980	1984	2019-2024
San Juan Generating Station	1	PNM	T30N, R15W	San Juan	Coal-fired power plant	1970	1973	2022
• Unit 4	2				Additional unit	1979	1982	2022
• SO_2 system	2				Pollution cleanup	1980	1982	2022
• Water management system	2				Water management	1981	1983	2022

Note: See Map C-1a for project locations.

*Status: 1 = existing; 2 = under construction.

Table C-2. BASELINE 1 PETROLEUM REFINERIES AND OIL FIELD DEVELOPMENT IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule: Initial Construction	Initial Production	Abandonment
B1	Caribou Four Corners Oil	1	Caribou Four Corners, Inc.	T29N, R14W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B2	Giant-Farmington Refinery	1	Giant Refinery Company	T29N, R12W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B3	Plateau, Inc.-Bloomfield Refinery	1	Plateau, Inc.	T29N, R11W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B4	Shell Oil Company-Ciniza Refinery	1	Shell Oil Company	T15N, R15W	McKinley	Petroleum refinery	Existing	Existing	Permanent
B5	Thriftway Company	1	Thriftway Company	T29N, R11W	San Juan	Petroleum refinery	Existing	Existing	Permanent
B6	General Crude Processing	1	General Crude Processing	T30N, R12W	San Juan	Oil treatment plant	Existing	Existing	Permanent
B7	Oil Field Development	1	All Involved	T17N to T32N R1E to R19W	San Juan, Rio Arriba, McKinley, Sandoval	Oil field development	Existing	Existing	Unknown

Note: See Map C-1b for project locations.

*Status: 1 = existing.

Table C-3. BASELINE 1 NATURAL GAS PROCESSING PLANTS AND GAS FIELD DEVELOPMENT IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule		
							Initial Construction	Initial Production	Abandonment
C1	Blanco	1	El Paso Natural Gas Company	T29N, R11W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C2	Chaco	1	El Paso Natural Gas Company	T26N, R12W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C3	Kutz Canyon	1	Southern Union Refining Company	T28N, R11W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C4	Lybrook	1	Southern Union Refining Company	T23N, R7W	Rio Arriba	Natural gas processing plant	Existing	Existing	Permanent
C5	San Juan River	1	El Paso Natural Gas Company	T29N, R15W	San Juan	Natural gas processing plant	Existing	Existing	Permanent
C6	Wingate Plant	1	El Paso Natural Gas Company	T15N, R17W	McKinley	Natural gas processing plant	Existing	Existing	Permanent
C7	Gas Field Development	1	All Involved	T23N to T32N, R1W to R14W	San Juan, Rio Arriba, Sandoval	Gas field development	Existing	Existing	Unknown

Note: See Map C-1b for project locations.

*Status: 1 = existing.

Table C-4. BASELINE 1 COAL MINES IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule: Initial Construction	Initial Production	Abandonment
D1	Arroyo No. 1	1	A.J. Firchau	T17N , R2W	Sandoval	Coal strip mine	Existing	Existing	Unknown, but not before 2000
D2	Bisti Mine	1	Sunbelt Mining Company	T23N, R13W	San Juan	Coal strip mine	1987	1980	2040
D3	Black Diamond Mine	2	Black Diamond Coal Company	T32N, R13W	San Juan	Coal strip mine	Unknown	Unknown	Unknown
D4	Con Paso-Burnham Mine	1	Consolidation Coal Company	T25N, R15&16W	San Juan	Coal strip mine	1980	1980	2018
D5	De-na-zin Mine	1	Sunbelt Mining Company	T23N, R13W	San Juan	Coal strip mine	1980	1980	1983
D6	Gallo Wash Mine	2	Alamito Coal Company	T21N, R8&9W	San Juan	Coal strip mine	Within next 10 years	Within next 10 years	40 years after initial production
D7	La Plata Mine	2	Western Coal Company	T32N, R13W	San Juan	Coal strip mine	1983	1984	2009
D8	Lee Ranch Mine	2	SF Coal Corporation	T15N, R7&8W; T16N, R8W	McKinley	Coal strip mine	1982	1983	2009
D9	McKinley Mine	1	Pittsburg and Midway Coal Company	22 miles northwest of Gallup (Navajo Reservation)	McKinley	Coal strip mine	Existing	Existing	2011

Table C-4. BASELINE 1 COAL MINES IN THE SAN JUAN BASIN REGION (concluded)

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule: Initial Construction	Initial Production	Abandonment
D10	Mentmore Mine	1	Carbon Coal Company	T16N, R19W	McKinley	Coal strip mine	Existing	Existing	1994-1999
D11	Navajo Mine	1	Utah International, Inc.	7 miles southwest of Fruitland (Navajo Reservation)	San Juan	Coal strip mine	Existing	Existing	2011
D12	San Juan Mine	1	San Juan Coal Company	T30N, R15W	San Juan	Coal strip mine	Existing	Existing	2017
D13	South Hospah Mine	2	Chaco Energy Company	T16&17N, R10W	McKinley	Coal strip mine	1983	1983	2013

Note: See Map C-1c for project locations.

*Status: 1 = existing; 2 = under development.

Table C-5. BASELINE 1 URANIUM MINES AND MILLS IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
E1	Churchrock No. 1	1	Kerr-McGee	T17N, R16W	McKinley	Uranium mine
E2	Churchrock No. 1E	1	Kerr-McGee	T17N, R16W	McKinley	Uranium mine
E3	Crownpoint	2	Continental Oil	T17N, R12W	McKinley	Uranium mine
E4	Crownpoint, Sec. 9	1	Mobil	T17N, R13W	McKinley	Uranium mine (in-situ leach)
E5	Enos Johnson	1	R. Williams Mining Company	9 miles west of Sanostee (Navajo Reservation)	San Juan	Uranium mine
E6	Johnny M	1	Ranchers Exploration and Development	T13N, R8W	McKinley	Uranium mine
E7	Mariano Lake	1	Gulf	T15N, R14W	McKinley	Uranium mine
E8	Mt. Taylor	1	Gulf	T13N, R8W	Cibola	Uranium mine
E9	NE Churchrock No. 4	1	United Nuclear	T17N, R16W	McKinley	Uranium mine
E10	Old Churchrock	1	United Nuclear	T16N, R16W	McKinley	Uranium mine
E11	P-10	1	Anaconda	T10N, R5W	Cibola	Uranium mine
E12	Roca Honda (Lee)	2	Kerr-McGee	T13N, R8W	McKinley	Uranium mine
E13	Ruby No. 2 and No. 3	1	Western Nuclear	T15N, R13W	McKinley	Uranium mines
E14	Ruby No. 4	2	Western Nuclear	T15N, R13W	McKinley	Uranium mine
E15	Sec. 12	1	Cobb	T14N, R10W	McKinley	Uranium mine
E16	Sec. 14	1	Cobb	T14N, R10W	McKinley	Uranium mine

Table C-5. BASELINE 1 URANIUM MINES AND MILLS IN THE SAN JUAN BASIN REGION (concluded)

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
E17	Sec. 19	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E18	Sec. 22	1	Kerr-McGee	T14N, R10W	McKinley	Uranium mine
E19	Sec. 23	1	Homestake	T14N, R10W	McKinley	Uranium mine
E20	Sec. 25	1	Homestake	T14N, R10W	McKinley	Uranium mine
E21	Sec. 30	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E22	Sec. 30W	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E23	Sec. 32	1	Homestake	T14N, R9W	McKinley	Uranium mine
E24	Sec. 33	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E25	Sec. 35	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E26	Sec. 36	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
E27	Ambrosia Lake	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mill
E28	Bluewater	1	Anaconda	T12N, R11W	Cibola	Uranium mill
E29	L-Bar (Seboyeta)	3	Sohio-Reserve	T11N, R5W	Cibola	Uranium mill
E30	Marquez	3	Bokum Resources	T13N, R5W	McKinley	Uranium mill
E31	Milan	1	United Nuclear-Homestake	T11N, R10W	Cibola	Uranium mill
E32	Mt. Taylor	3	Gulf Mineral Resources	T13N, R8W	McKinley	Uranium mill
E33	Sec. 2 (Church Rock)	1	United Nuclear	T17N, R16W	McKinley	Uranium mill

Note: See Map C-1c for project locations.

*Status: 1 = active as of 9/1/81; 2 = under development; 3 = licensed, but not operating as of 9/1/81.

Table C-6. BASELINE 1 OTHER PROJECTS IN THE SAN JUAN BASIN REGION

Project Name	Status*	Company	Counties Involved (State)	Project	Proposed Time Schedule: Initial Construction	Initial Production	Abandonment
Animas-La Plata Project	3	Bureau of Reclamation (USDI)	San Juan (NM) La Plata (CO) Montezuma (CO)	Municipal and agricultural water supply system	1983	1987	Permanent
Navajo Indian Irrigation Project	1,2	Bureau of Indian Affairs (USDI)	San Juan (NM)	Agricultural water supply system and development	1967	1976	Permanent
Star Lake-Bisti Railroad	3	Star Lake Railroad Company	San Juan (NM) McKinley (NM)	Railroad (common-carrier)	1982	1984	Unknown, but most likely after 2020

Note: See Map C-1c for project locations.

*Status: 1 = existing; 2 = under development; 3 = permitted, but no construction yet.

Table C-7. BASELINE 2 COAL MINES IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project	Proposed Time Schedule		
							Initial Construction	Initial Production	Abandonment
G1	La Ventana Coal Mine	1	Ideal Basic Industries Coal Company	T19&20N, R1&2W	Sandoval	Underground coal mine	Unknown	Unknown	35 years after initial production
G2	Star Lake Mine	1	Chaco Energy Company	T20N, R6&7W	McKinley	Coal strip mine	Unknown	Unknown	35 years after initial production

Note: See Map C-2 for project locations.

*Status: 1 = permit application being processed.

Table C-8. BASELINE 2 URANIUM MINES IN THE SAN JUAN BASIN REGION

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
H1	Ambrosia Lake	1	Cobb	T14N, R10W	McKinley	Uranium mine
H2	Ann Lee	1	United Nuclear	T14N, R9W	McKinley	Uranium mine
H3	Bernabe	1	Conoco	T12N, R2W	Sandoval	Uranium mine
H4	Flea Doris Ext.	1	MM Mining	T13N, R9W	McKinley	Uranium mine
H5	Haystack	1	Todilto Exploration	T13N, R10W	McKinley	Uranium mine
H6	Hope Mine	1	Ranchers	T13N, R10W	McKinley	Uranium mine
H7	Isabella	2	Koppen	T13N, R9W	McKinley	Uranium mine
H8	J.J. No. 1	1	Sohio	T11N, R5W	Cibola	Uranium mine
H9	Marquez No. 1 & No. 2	1	Bokum Resources	T13N, R5W	McKinley	Uranium mines
H10	Mobil	2	Mobil Oil-TVA	T17N, R13W	McKinley	Uranium mine (In-situ leach)
H11	Nose Rock No. 1 & No. 2	1	Phillips Uranium	T19N, R11&12W	McKinley	Uranium mines
H12	Nufuels Pilot	2	Nufuels	T17N, R12W	McKinley	Uranium mine
H13	Piedre Triste	1	Todilto Exploration	T13N, R9W	McKinley	Uranium mine
H14	Poison Canyon	1	Reserve Oil	T13N, R9W	McKinley	Uranium mine
H15	PW-2/3	1	Anaconda	T11N, R5W	Cibola	Uranium mine
H16	Rio Puerco	1	Kerr-McGee	T12N, R4W	Cibola	Uranium mine
H17	Sandstone	1	United Nuclear	T14N, R9W	McKinley	Uranium mine

Table C-8. BASELINE 2 URANIUM MINES IN THE SAN JUAN BASIN REGION (concluded)

Project No./Map Reference	Project Name	Status*	Company	Approximate Location	County	Project
H18	Sec. 13	1	UN-Homestake	T14N, R10W	McKinley	Uranium mine
H19	Sec. 15	1	UN-Homestake	T14N, R10W	McKinley	Uranium mine
H20	Sec. 17	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
H21	Sec. 24	1	Kerr-McGee	T14N, R9W	McKinley	Uranium mine
H22	Sec. 27	1	United Nuclear	T14N, R9W	McKinley	Uranium mine
H23	Spencer Shaft	1	Koppen	T14N, R9W	McKinley	Uranium mine
H24	St. Anthony	1	United Nuclear	T11N, R4W	Cibola	Uranium mines (open pit/shaft)
H25	Todilto Exploration	1	Todilto Exploration	T13N, R9W	McKinley	Uranium mine
H26	West Ranch	1	Cobb	T15N, R11W	McKinley	Uranium mine

Note: See Map C-2 for project locations.

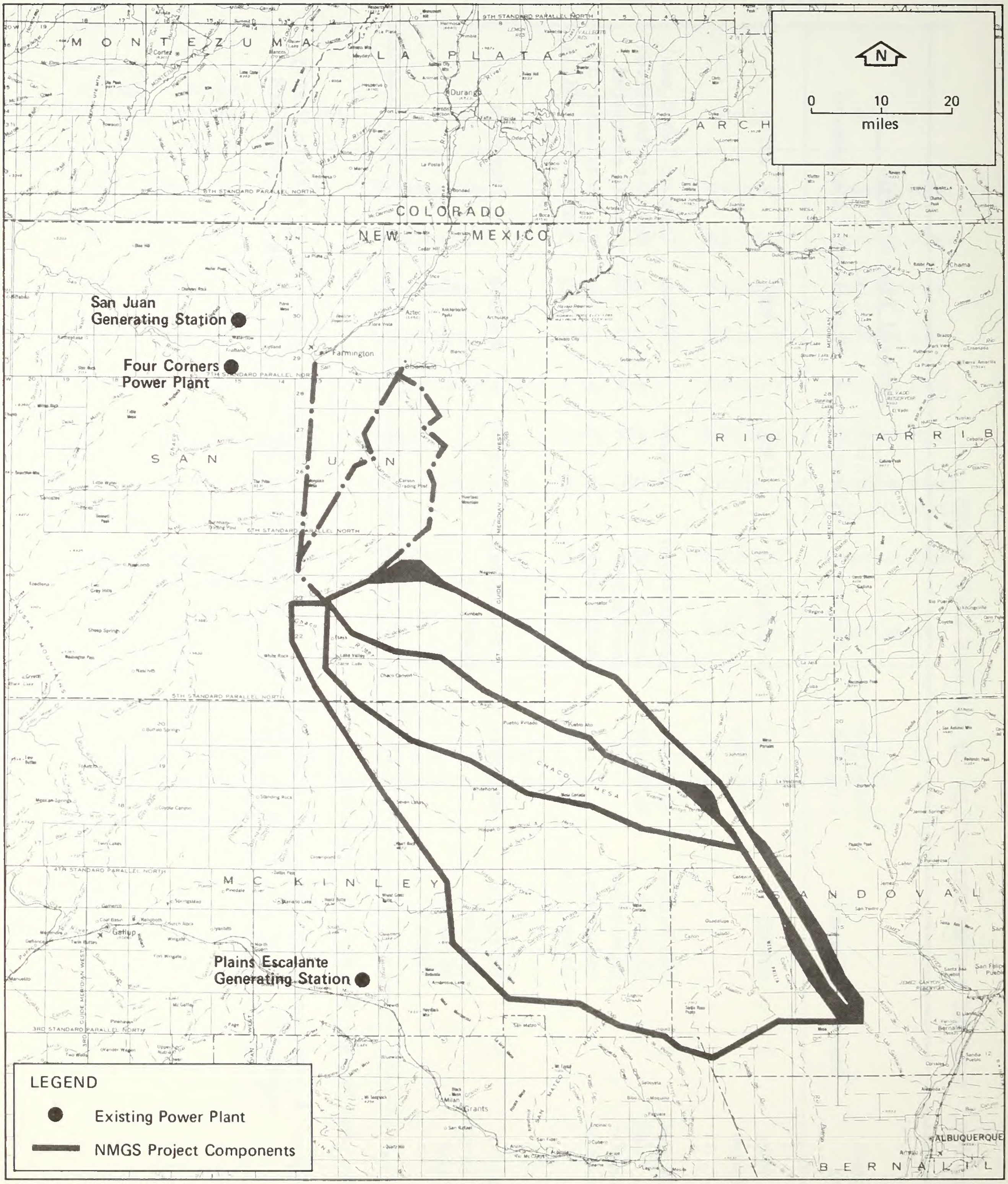
*Status: 1 = permitted mines that are shut down or on hold (as of 9/81); 2 = under development, but some necessary permits still being processed (as of 10/81).

Table C-9. BASELINE 2 OTHER PROJECTS IN THE SAN JUAN BASIN REGION

Project Name	Status*	Company	Counties Involved	Project	Proposed Time Schedule		
					Initial Construction	Initial Production	Abandonment
Con Paso Railroad	1	CONSOL	San Juan, McKinley	Railroad	1983	1984	2019
Fruitland Coal Load Transmission Line	2	PNM/Plains Electric Generation and Trans. Co-op., Inc.	San Juan, McKinley	Transmission line(s) and associated facilities	Unknown	Unknown	Unknown (when coal mines to be served close; estimated to be at least 35 years after initial production)
Navajo Dam Power Project	3	Bureau of Indian Affairs (USDI)	San Juan	Hydroelectric plant	1975	Unknown	Permanent

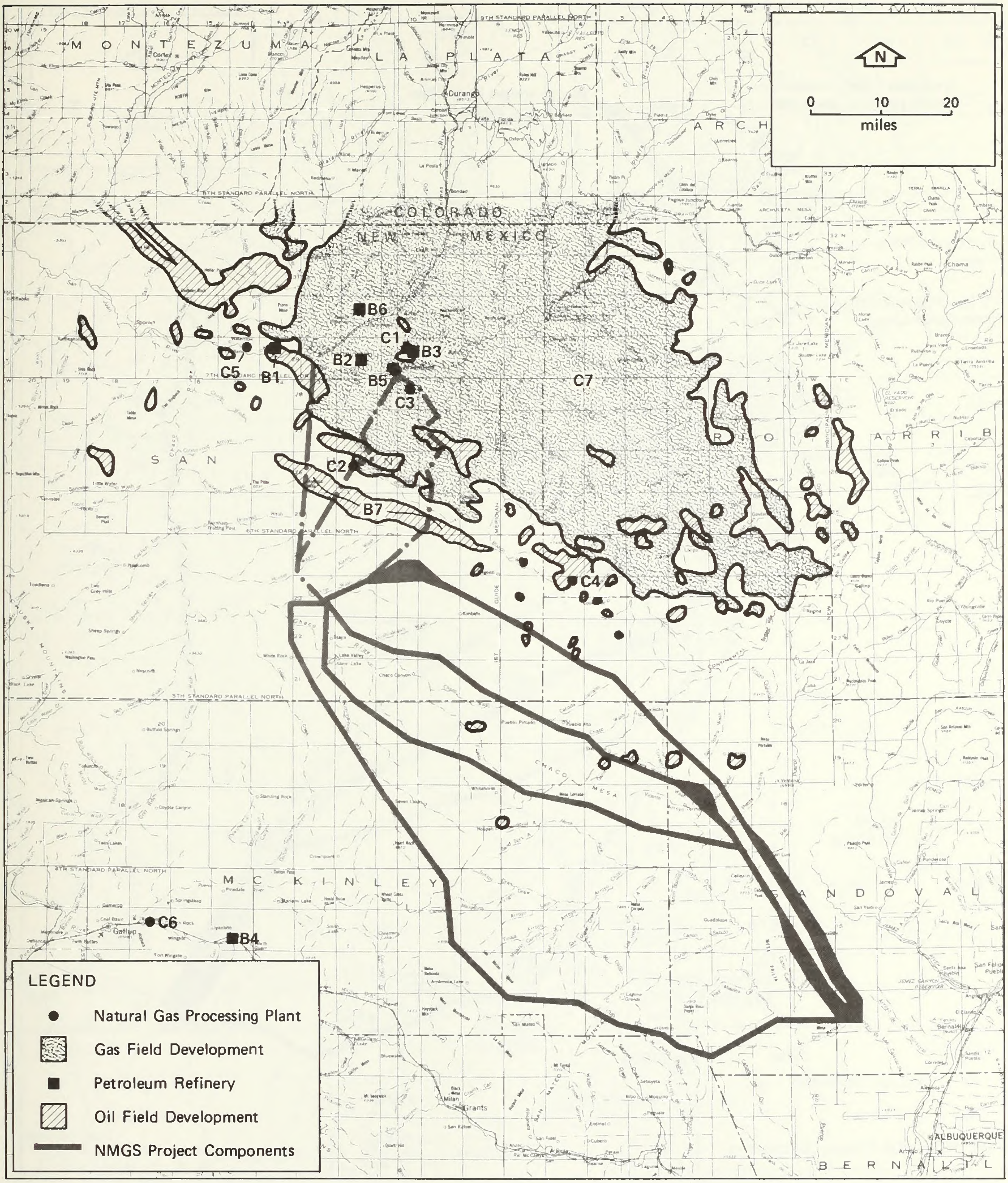
Note: See Map C-2 for project locations.

*Status: 1 = proposed, dependent on outcome of forthcoming EIS; 2 = proposed, dependent on various agency approvals; 3 = partially constructed, completion dependent on resolution of legal problems and outcome of Senate proposal No. 306.



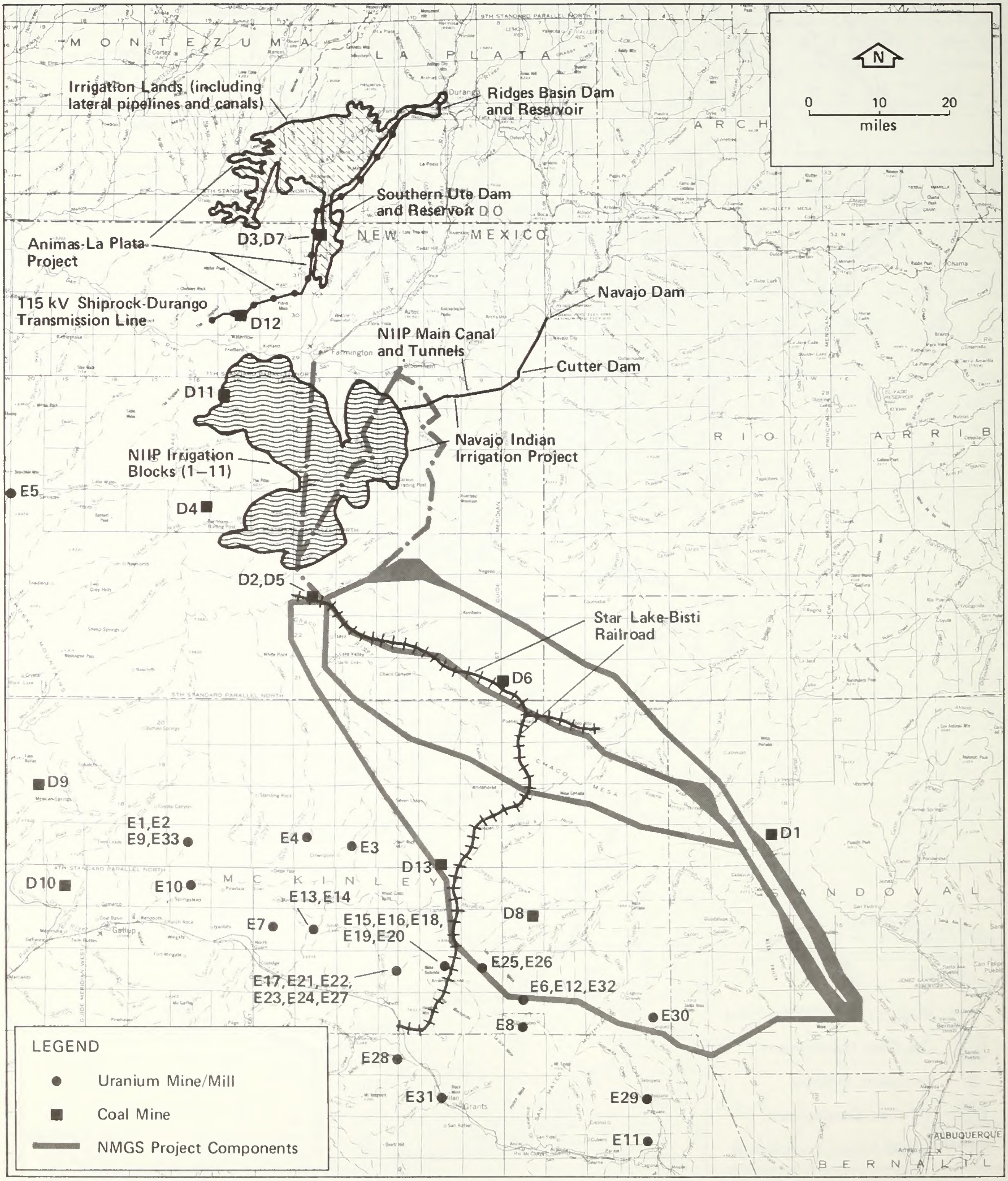
Note: See Table C-1 for project information

Map C-1a. BASELINE 1 PROJECTS IN THE SAN JUAN BASIN REGION



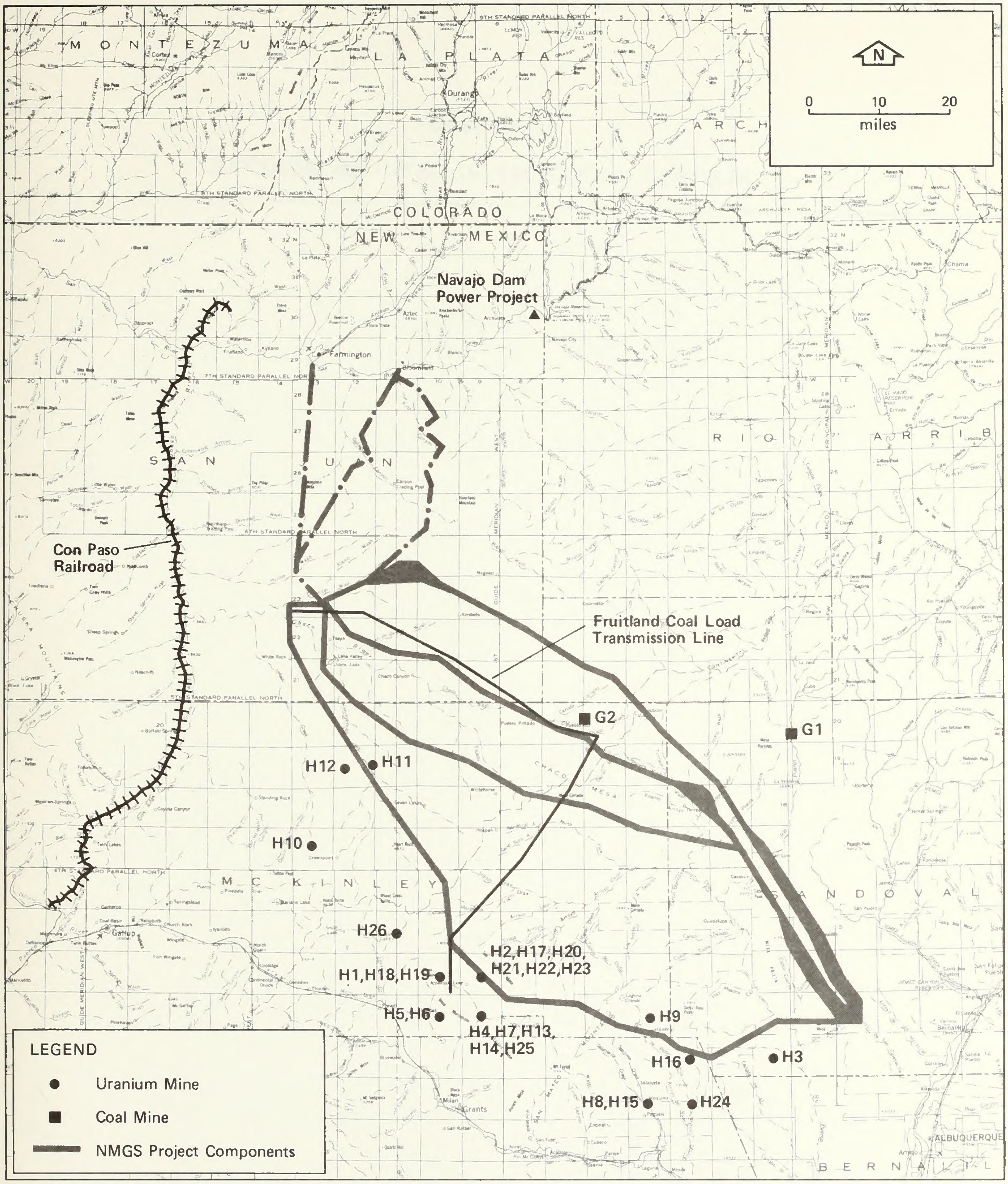
Note: See Tables C-2 and C-3 for project information

Map C-1b. BASELINE 1 PROJECTS IN THE SAN JUAN BASIN REGION



Note: See Tables C-4, C-5, and C-6 for project information

Map C-1c. BASELINE 1 PROJECTS IN THE SAN JUAN BASIN REGION



Note: See Tables C-7, C-8, and C-9 for project information

Map C-2. BASELINE 2 PROJECTS IN THE SAN JUAN BASIN REGION

Appendix D

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Appendix E

PNM PURPOSE AND NEED STATEMENT COMMUNICATIONS

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

July 20, 1981

Mr. Charles Luscher
State Director
Bureau of Land Management
Post Office Box 1449
Santa Fe, NM 87501

Dear Mr. Luscher:

Subject: Re-scoping New Mexico Generating Station (NMGS)

In our July 10, 1981, meeting, PNM indicated NMGS was redefined by the dropping of outside New Mexico requirements and the commitment of that station to New Mexico needs. PNM's forecasts of economic activity incorporate the effect of major business enterprises considering locating in New Mexico, based on inquiries and preliminary negotiations. The redefinition is a result of recent changes affecting PNM's full development loads and resources scenario as described in Attachment II. Attachment II is the Purpose and Need for the proposed project. Attachment I is a project fact sheet.

The redefined NMGS project still consists of a 2000 MW coal-fired generating station with four 500 MW units. The in-service dates for the units are Unit 1-1990, Unit 2-1993, Unit 3-1995, and Unit 4-1998. Associated with the generating station are two 500 kV transmission lines to Albuquerque, 500 kV ties to the Four Corners-Ambrosia 500 kV transmission line, and two water pipelines from the San Juan River to the generating station. PNM will provide the NBEI team a revised and detailed project description by July 24, 1981.

In addition, please be advised that we have assigned Bill Eglinton as the Project Manager. Bill will report to Dave Bedford, the sponsoring Vice-President for NMGS, but we anticipate our principal contact with BLM to be Robert Jackson.

I wish to thank all the BLM and third party contractor staff for their work on this project, especially Dennis Erhart, Leslie Cone and the NBEI team. Please extend this appreciation to Stan Wagner of the Arizona BLM and Gerry Alendal and Bill Payne of the California BLM. Thank them for their early efforts and tell them we regret any inconvenience our change has caused.

Wirth Associates and Woodward-Clyde are also to be thanked for their contribution to the EIS effort. We look forward to continue working with you in the EIS process.

Sincerely,

J. D. Geist
President

JDG:ah
Attachments
cc: C. D. Bedford
J. P. Bundrant
W. M. Eglinton
J. B. Mulcock
A. J. Robison
R. B. Rountree
E. Yao

ATTACHMENT I

NMGS RESCOPING
FACT SHEET
NEW MEXICO GENERATING STATION

STATION TYPE AND SIZE:	Coal Fired Four (4) 500 Megawatt Units 2000 Megawatts Total
STATION LOCATION:	Bisti Area, San Juan County, approximately 35 miles south of Farmington, New Mexico
STATION OWNERS:	Public Service Company of New Mexico (PNM)
PROJECT MANAGER AND OPERATING AGENT:	Public Service Company of New Mexico
PROJECT TIMETABLE:	Licenses, permits and approvals and land acquisition — Mid 1983 Start Engineering — 1983 Start Construction — 1984 Unit One in Service — Mid 1990 Unit Two in Service — Mid 1993 Unit Three in Service — Mid 1995 Unit Four in Service — Mid 1998
PROJECT COST:	Cash cost estimated at 4.6 billion excluding transmission lines and other support items. Approximately 29% of total cost will be devoted to pollution control equipment (sulfur dioxide removal, electrostatic precipitators and water treatment equipment).
COAL SUPPLY:	Mine mouth. Lifetime need of approximately 300 million tons which can readily be supplied from the estimated 4 billion tons of uncommitte strippable, sub-bitumionous reserves within 30 miles of site.
WATER USE:	Each unit would use up to about 8600 acre-feet per year. The plant would be designed for zero discharge of waste water.
WATER SOURCES:	Water would come from one or a combination of the following sources: 1. San Juan River Water. 2. Bisti Area Well Field (4000-6000 feet deep). 3. Uranium Mine Water from Crownpoint are:
TRANSMISSION SYSTEM:	1-500 kV transmission loop to already proposed 500 kV Four Corners-Ambrosia-Pajarito transmission line (5 miles), and other transmission facilities as may be needed for in-state deliveries.

WCW:sks
7/15/81

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

May 6, 1982

Ms. Leslie Cone
Project Manager
Bureau of Land Management
509 Camino de la Marquez
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: NMGS Purpose and Need

In my January 21, 1982, letter to you, I have inadvertently left out a word "reasonable" in the third paragraph under section 2: Background of the "PNM's Purpose and Need for NMGS" enclosure. This paragraph should read:

> "PNM's long range planning program is conducted pursuant to the New Mexico Public Utility Act and regulation by the N.M.P.S.C. The company's planning for future generation needs is consistent with its corporate mission to provide adequate and reliable electric service at the lowest reasonable cost to the ratepayer while providing a reasonable return to PNM investors."

In addition, I would like to reiterate the following, which PNM told BLM at the July 10, 1981, meeting between our management and yours:

> "Under both the low and high load forecast scenarios, PNM will have short term power sales without additional transmission lines involved. PNM will not preclude any long term power sales to California and Arizona from NMGS as long as no new transmission lines are required for the sales. If some of the industrial customers or the in-state utilities want ownership in NMGS, PNM will seriously consider them as long as our own needs can be met, the EIS process is not significantly impacted and the in-state transmission system in the current EIS is adequate."

Sincerely,

Bill

W. M. Eglinton
NMGS Project Manager

EY:mkd
cc: Mr. C. D. Bedford
Mr. W. C. Wygant
Mr. Ely Yao

mutliple sources. PNM acquired coal reserves in the San Juan Basin to supply fuel for future units. At the same time, PNM was investigating other base load alternatives such as nuclear. Natural gas is now used primarily for peaking purposes.

PNM has delineated specific objectives, through its fuels planning process by which compliance to National Energy Policies may be met.

These are: (From PNM's Fuels Management Document [Draft])

1. Acquire and/or use those natural resources that are regionally abundant for base load, intermediate and peaking power generation;

2. Improve existing facilities (including transmission) for greater efficiency and reliability while maintaining a desirable environment;

3. Study the possibility of converting existing plants to accept new fuels or utilize new processes to generate electricity based on economics, costs, and benefits;

4. Implement methods to minimize the environmental impact of power production facilities;

5. Promote strong load management and conversation programs;

6. Investigate possibilities for implementing new fuel resources and technologies, such as coal gasification, solar, wind, and geothermal development; and

7. Assure conformity of fuels guidelines with provisions outlined in the PNM Corporate Goals and Objectives.

As can be seen from item #1, a priority is given to development of regional fuel resources.

Additionally, PNM has a basic commitment to assist in stimulating the economy of New Mexico; utilization of Fruitland Formation Coal from the San Juan Basin NM, therefore, meets PNM's primary objectives.

Further elaboration as to the benefits of coal, its availability, etc. are included in the enclosed draft Fuels Management Document.

Sincerely,

Bill

William M. Eglinton
NMGS Project Manager

DGS:jam
Enclosure

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO

ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

March 29, 1982

Ms. Leslie Cone
Bureau of Land Management
United States Department of
the Interior
Post Office Box 1449
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: NMGS Statement of Purpose

On January 21, 1982, Public Service Company of New Mexico (PNM) submitted to BLM, our Statement of Purpose for the New Mexico Generating Station. Fundamental to the construction of that generating facility is the associated development of coal resources within the state of New Mexico.

To this end we offer you further elaboration of PNM's purpose of contemplating the utilization of this valuable resource. This statement is in response to questions raised during recent public meetings and should serve to further document PNM's Phase I goals for NMGS.

Background

A. National Energy Policy

Electric utilities are faced with continued increases in electrical demand at a time when traditional energy resources are becoming scarcer and more expensive. The OPEC oil embargo of 1973/1974 forced the United States to review its current policies regarding the importation of large quantities of petroleum fuels for electrical energy production. Subsequent cost increases for gas and oil have also caused utilities to reevaluate their future fuel resources and those companies with the capacity are switching to other methods for supplying baseload electrical power such as coal or nuclear. The United States has adequate supplies of both coal and uranium to meet electrical power demands in the future. Indeed certain projections for New Mexico indicate there exist coal reserves which could last 200 to 300 years with current mining technology and at a similar removal rate. This resource is primarily located in the San Juan Basin of northwest New Mexico.

PNM management had the foresight to predict the rapid depletion of our nation's oil and gas resources in the mid-1950's. They realized that it made prudent business sense to shift from dependence on a single fuel source to

TABLE 1

NEW MEXICO GENERATING STATION PROJECT

PROJECT PARAMETERS

FOR

ENVIRONMENTAL IMPACT ASSESSMENT

STATION TYPE & SIZE:	Coal fired Maximum development 2000 MW in 500 MW increments
STATION LOCATION:	Bisti area, San Juan County, New Mexico, approximately 35 miles south of Farmington, New Mexico
MILESTONES:	. Determine the feasibility and/or acquire land, water, and fuel, and complete EIS process (mid-1983) . Decide on whether or not to proceed with permitting and design (mid-1983) . Earliest date anticipated for Unit 1 operation (early to mid-1990) with subsequent units thru the year 2000.
RESOURCE REQUIREMENTS:	
LAND:	Exchange with BLM for PNM owned properties at Ute Mountain area for Federal land near Bisti
COAL SUPPLY:	Lifetime requirement of approximately 300 million tons to be supplied from the San Juan Basin.
WATER SUPPLY:	Each unit would use up to about 8600 acre-feet per year. The plant would be designed for zero discharge of waste water. Water would come from the San Juan River. If not available, water supply would be supplemented from the Bisti area well field.
TRANSMISSION SYSTEM:	1-500 kV transmission loop to the proposed 500 kV Four Corners-Ambrosia-Pajarito transmission line (5 miles), and other transmission facilities as may be needed for subsequent units.

takes place while new data and altered circumstances dictate the need to accelerate or slow down the potential completion dates due to changes in the load and resource picture.

3. NEW MEXICO STATION EIS

To assess the NMGS Project as the next potential coal option for the 1990's, PNM has requested the Bureau of Land Management (BLM) to consider the issuance of right-of-way grants for any proposed water conveyance system and transmission lines associated with the project.

In response to PNM's application for those facilities, BLM, New Mexico State Office, was designated as the federal lead agency to prepare the EIS for the project in accordance with the NEPA process.

Depending on the outcome of NEPA/EIS process, and the land, water, and fuel resource acquisitions, PNM recognizes that there are many other regulatory and permit requirements that would have to be met. These include construction permit, location permit, numerous environmental approvals by state and federal agencies, and a certificate of convenience and necessity by the New Mexico Public Service Commission, before any construction would be allowed to begin.

The project parameters assumed for the NMGS Project are presented in Table 1.

future load growth. The impact of the increased energy prices, natural gas deregulation, energy and demand conservation, solar energy applications, innovative rate design, and direct load control techniques, are among the various factors accounted for in these analyses.

For more than twenty years, PNM has evaluated and, in some cases, pursued various options for meeting customer energy requirements. Such options have included:

1. Coal - Four Corners Project
   San Juan Project
2. Nuclear - Arizona Nuclear Power Project
3. Geothermal - Baca Geothermal Project
4. Hydro - Pumped Storage Project
5. Solar - Solar Hybrid Repowering Project
6. Conservation and Load Management Programs

These options, along with such technologies as wind, refuse burning, coal gasification, and fuel cells, are being continuously measured against:

- Commercial availability of the technology required for the option
- Availability of the required resources
- Environmental and social impacts
- Capital investment required
- The ability of the corporation to successfully implement the option in the time frame and dollars required.

Load growth in New Mexico is such that a combination of options is required to meet anticipated demand. No single option can meet all needs. Based upon current load growth forecasts, it is anticipated that additional base load generating capability will be required between 1990 and 2000. Therefore, PNM has established the New Mexico Generating Station Project. This project is intended to place emphasis on the coal option for meeting anticipated needs. In examining this option, the company is assessing the feasibility and availability of required resources (land, water, and fuel), and the probable impact on the environment from pursuing such a course. PNM views coal as the best available option for meeting part of the energy requirements of the 1990's. Accordingly, the company has chosen to subject the risks and benefits from coal development to detailed analysis. This analysis will be conducted in conjunction with continued study of the other options presently in use in the generating system.

In summary, the hallmark of system planning must be flexibility. Flexibility is required by the rapidly changing demands for electrical energy and by the rapid changes in the power supply options available to the company. This flexibility must be especially evident in planning new generation facilities. The eight to twelve years required to bring a coal station into commercial operation makes it difficult to establish a "date certain". Nevertheless, the same long lead-time from conception to commercial operation required that the company start very early to assess the risks and weigh the benefits of a given option. This process

PUBLIC SERVICE COMPANY OF NEW MEXICO'S
PURPOSE AND NEED
for
NEW MEXICO GENERATING STATION PROJECT

1. STATEMENT OF PURPOSE

The purpose of this phase of the New Mexico Generating Station (NMGS) Project is to provide the management of the Public Service Company of New Mexico (PNM) with sufficient information to assess the benefits and risks of developing a coal-fired generating station. This risk and benefit analysis will be evaluated against a full range of options to meet the electrical energy needs of PNM's customers in the 1990's and beyond. Among the options considered by PNM are nuclear, geothermal, solar, hydro, conservation, and others. In order to make the best decision, PNM management requires information related to the feasibility and availability of such coal-related resources as land, water, and fuel. Additionally, PNM management requires information regarding the suitability of the proposed project's impact on the human and natural environments in accordance with the NEPA process.

As set forth in the July 10, 1981, letter from PNM to BLM, the proposed project consists of a coal-fired generating station with up to 4 - 500 MW units. The units will be placed in service in the 1990's, with the first unit possibly as early as May, 1990. Associated with the generating station are two 500 kV transmission lines to Albuquerque, a 500 kV tie to the Four Corners-Ambrosia 500 kV lines, and two water pipelines from San Juan River to the generating station.

2. BACKGROUND

Planning and constructing new power generation facilities is a complex and dynamic process. Multiple objectives must be satisfied within the limits of technological and economic feasibility. The chief planning objective is to match the supply of power with the customer's demand.

Given the omnipresent uncertainty of the future and the long time period, often in excess of ten years, that it takes to plan and construct a facility, additional complexity is added. The human, financial, and physical resources committed to such planning are enormous.

PNM's long range planning program is conducted pursuant to the New Mexico Public Utility Act and regulation by the N.M.P.S.C. The company's planning for future generation needs is consistent with its corporate mission to provide adequate and reliable electric service at the lowest cost to the ratepayer while providing a reasonable return to PNM investors.

To accomplish this mission, PNM employs state of the art econometric modeling programs and forecasting techniques. The data deriving from those tools are incorporated into studies which indicate a range of

OUTLINE

of

PUBLIC SERVICE COMPANY OF NEW MEXICO'S

PURPOSE AND NEED

for

NEW MEXICO GENERATING STATION PROJECT

PNM PUBLIC SERVICE COMPANY OF NEW MEXICO
ALVARADO SQUARE ALBUQUERQUE, NEW MEXICO 87158

January 21, 1982

Ms. Leslie Cone
Project Manager
Bureau of Land Management
509 Camino de la Marquez
Santa Fe, NM 87501

Dear Ms. Cone:

Subject: NMGS Purpose and Need

Following the July 10 Rescoping of the New Mexico Generating Station Project, PNM has provided BLM with considerable technical information regarding the Project Description and Load Forecasts. This data serves as the basis for the preparation of the NMGS EIS. While the data provides project description, the attached document is an outline of PNM's purpose and need for the NMGS Project.

The primary purpose of this statement is to emphasize PNM's intention to study carefully the feasibility and availability of such coal plant related resources as land, water, and fuel for needed electrical generation that may materialize as early as 1990. In addition to the acquisition of such resources, PNM wants to assure that the impact resulting from such a project will assess and address the human and natural environment in accordance with the NEPA process. Such resource acquisition and environmental assessment precedes any further corporate commitment to the substantial financial resources necessary for proceeding with final permitting, design, and construction.

This outline is not intended to replace or conflict with information previously provided. Rather, it is intended to convey the intent of the project in this phase and to provide the BLM with the basis for identifying alternatives to this project.

Sincerely,

Bill/msf

W. M. Eglinton
NMGS Project Manager

WME:msf
Attachments
cc: C. D. Bedford

Appendix F

AUTHORIZING ACTIONS

FEDERAL

Bureau of Land Management (BLM)

The BLM is responsible for authorizing the actions below and for coordinating the preparation of ROW stipulations by affected federal agencies to ensure consistency between agencies.

1. Issuance of an approval of the use of land for the NMGS site (now held by BLM), whether through a ROW grant, lease, sale, or exchange.
2. Issuance of a grant of ROW for construction and operation of water pipelines, transmission lines, and associated facilities (e.g., pump stations, communication lines, access roads, microwave towers). The proposed and alternative transmission lines would cross from 4.7 to 64.4 miles of public land, depending on which alternatives are selected. The proposed and alternative water pipelines would cross from 8.6 to 36.2 miles of public land, depending on which alternative is selected. The ROW application would be processed under the authority of Title IV of the Federal Land Policy and Management Act of 1976 (FLPMA, 43 CFR Part 2800). The ROW grants would be issued by the BLM New Mexico State Office.
3. Prior to construction, temporary use permits (TUPs) would be required for temporary work and storage sites at drainage crossings, highway and railroad crossings, or other utility crossings. These permits would be issued by the appropriate BLM District Office under the authority of 43 CFR 2800, as detailed in the Federal Register, July 1, 1980.
4. Issuance of an undetermined number of Noncompetitive (Negotiated) Sales of Mineral Material (commercial fill, sand and gravel, and other surfacing or construction material of common variety) under 43 CFR 3611, Noncompetitive Sales. These would be issued by the appropriate BLM District Office.

The BLM and all federal agencies are also responsible for compliance with certain applicable federal laws, orders, and regulations. For this project they are:

- Endangered Species Act of 1973 (as amended), Section 7, in accordance with 50 CFR 402, Interagency Cooperation
- Executive Order 11593 (Protection and Enhancement of the Cultural Environment) and the Historic Preservation Act of 1966 (as amended), Section 106, in accordance with 36 CFR 800 (Protection of Historic and Cultural Properties)
- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands

Environmental Protection Agency (EPA)

- Under statutory authority of the Clean Air Act Amendments of 1977 and regulatory authority 40 CFR 5221 and 40 CFR 124, a Prevention of Significant Deterioration (PSD) Permit would be required to prevent the deterioration of air quality. Partial

authority for this permit was transferred to NMEID in February 1982. At present, the NMEID performs technical review of the application and the EPA would grant the permit.

- Under authority of the Clean Air Act Amendments of 1977 and 40 CFR 60, a New Source Performance Review Notification would be filed with the EPA. This notification applies to the construction of new air pollution sources subject to EPA-New Source Performance Standards (NSPS).
- A National Pollutant Discharge Elimination System (NPDES) Permit would be required if hydrostatic pipeline test water or plant discharge wastewater is discharged into the San Juan River or any other stream. NPDES permits are issued under the authority of Section 402 of the Clean Water Act and Public Law 95-217.

Bureau of Reclamation (BR)

- Under the Colorado Storage Project Act of 1956, and as implemented by the Navajo Indian Irrigation Project Act of 1962, a contract with the Secretary of Interior would need to be obtained if the applicant intends to obtain uncontracted water from the Navajo Reservoir.
- Under the Colorado Storage Project Act of 1956, and as implemented by the Navajo Indian Irrigation Project Act of 1962, approval of the Secretary of Interior would be required if the applicant intends to negotiate a contract with a water user who has an existing contract for Navajo Reservoir water.

Army Corps of Engineers (COE)

- Under Section 404 of the Clean Water Act of 1977, as implemented by COE regulations (33 CFR 323), a Section 404 permit would be required for construction of the water intake structure on the San Juan River. On the basis of the project description information and an impact assessment supplied by the applicant, COE Albuquerque District Office will coordinate the permit application.

Bureau of Indian Affairs (BIA)

The proposed and alternative transmission lines would cross from 19.4 to 39.8 miles of lands under BIA jurisdiction, depending on which alternatives are selected. The proposed and alternative water pipelines would cross from 0.3 to 24.8 miles of lands under BIA jurisdiction, depending on which ROW is selected.

- The BIA is responsible for the issuance of any grants of ROW for construction and operation of a pipeline through Indian tribal lands. The BIA exercises the Secretary of the Interior's trust responsibility for review and approval of agreements between the Indian tribes and private companies concerning development on Indian land. Secretarial approval of actions on Indian lands, in his trust capacity, are independent of ROW approval on public lands. A grant of the proposed ROW and approval of any of the related developments discussed in this EIS does not commit the Secretary of the Interior to any decision regarding Indian lands.
- The ROW would be approved subject to standard requirements imposed by the terms and conditions of the ROW grant including duration of the grant, ROW widths, fees or costs, and bonding to secure obligations. Rights-of-way across Tribal Trust Lands administered by the BIA as well as Indian Tribal Fee Lands would be negotiated with the respective Indian tribes. Rights-of-way across individual trust (allotted) lands administered by the BIA would be negotiated with the individual Indian owners.
- Authority for issuance of these ROWs would rest with the superintendent in charge of the reservation on which the lands involved are situated, in accordance with 25 CFR 161.25, Rights of-Way over Indian Lands.

Forest Service (FS)

The T4 transmission line alternative would cross 10.3 miles of FS lands.

- In the event that FS lands would be crossed by a transmission line alternative (Cibola National Forest), an existing cooperative agreement provides for procedures and assigns

responsibility for the processing, granting, and administration of the ROW and related facilities to BLM.

STATE OF NEW MEXICO

New Mexico Environmental Improvement Division (EID)

- Under the New Mexico Air Quality Control Act (Section 74-2-7) and EID Regulation 702, a Permit to Construct would be required in order to comply with New Mexico Ambient Air Quality Standards. Regulations apply to projects which would emit pollutants greater than 10 pounds per hour or 25 tons per year.
- Under the New Mexico Water Quality Control Act (NMSA 1978) and Regulation 1-201 of the New Mexico Water Quality Control Commission (July 2, 1981), a Notice of Intent to Discharge must be filed if hydrostatic pipeline test water or plant discharge wastewater is discharged to any streams.
- If hydrostatic pipeline test water is discharged so that it may move directly or indirectly to ground water, a Discharge Plan must be submitted and approved by the Director of EID according to Section 3-106.C of New Mexico Water Quality Control Commission Regulations.
- Under Regulation 3-106 of the New Mexico Water Quality Control Commission, a Discharge Plan would have to be submitted to NMEID before operation of the evaporation and coal-pile runoff ponds could begin.
- Under Regulation 1-202 of the New Mexico Water Quality Control Commission, a Sewage Treatment Design Plan would be filed with the New Mexico Water Pollution Control Bureau of EID.

New Mexico State Engineer (SE)

- A permit application has been filed by the applicant with the SE to appropriate underground water from a declared water basin (San Juan Basin). The applicant is currently waiting for a determination from the State Engineer.
- Under NMSA-1978 and Article 72-5, a Permit to Appropriate the Surface Waters of New Mexico would be required. The permit would be required because the construction of a dam at the water storage reservoir falls under the statutory authority of the SE to ensure safety of dams that would impound public water.
- Under New Mexico Surface Water Code of 1907 and Article 72-5 of NMSA-1978, a Point of Diversion Permit would be necessary for construction of a water intake and diversion on the San Juan River.

New Mexico Public Service Commission (PSC)

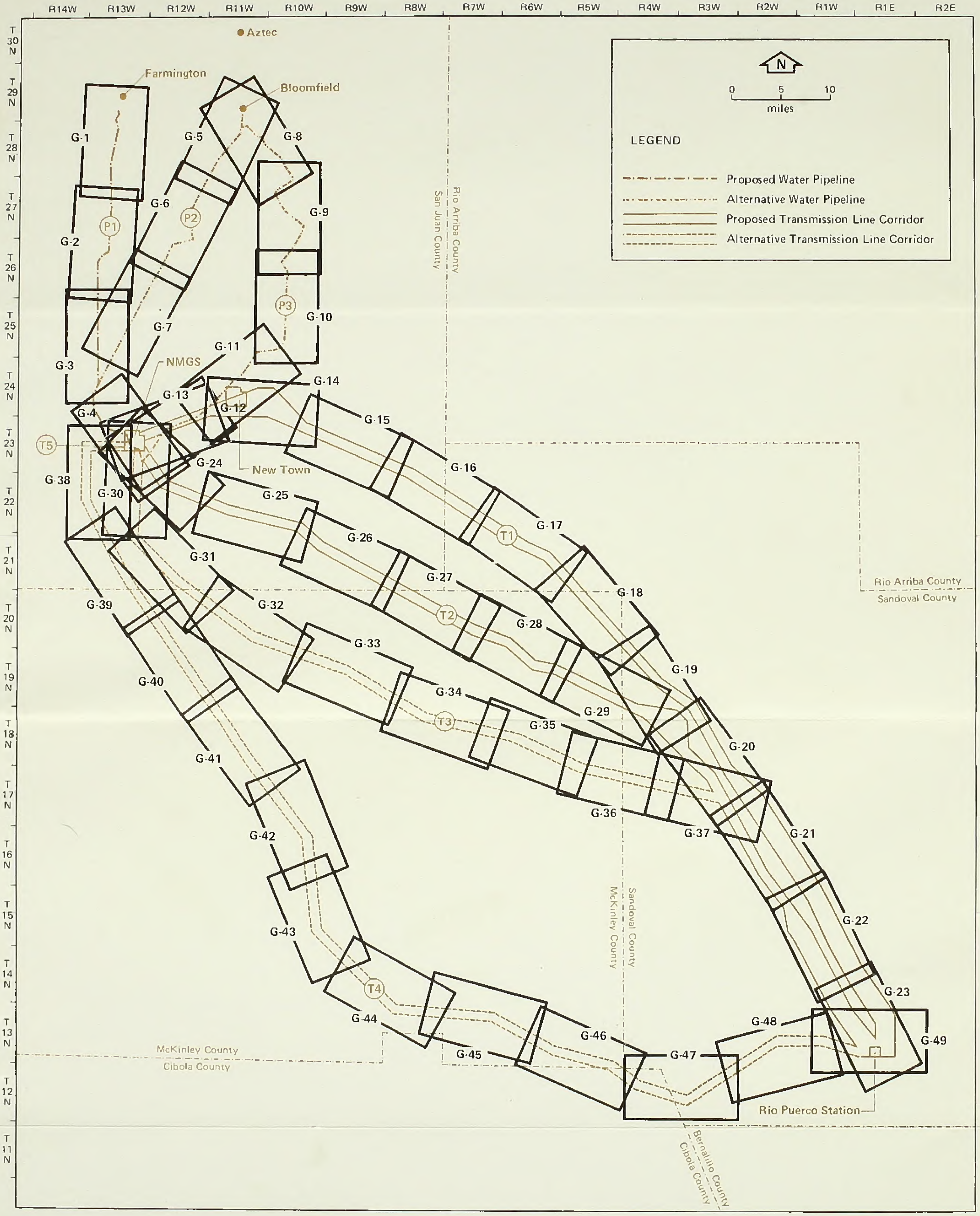
- A Certificate of Public Convenience and Necessity and a Location Permit would be required before the applicant could begin construction or operation of the proposed plant, system, or extension thereof. Application would be made as specified by the Public Utility Act of 1967 and NMSA-1978 (Chapters 62-9-1 through 62-9-3).

New Mexico Highway Department (HD)

A permit to install utility facilities within public ROWs would be required whenever a transmission line or water pipeline would cross or be placed within a federally funded or state highway.

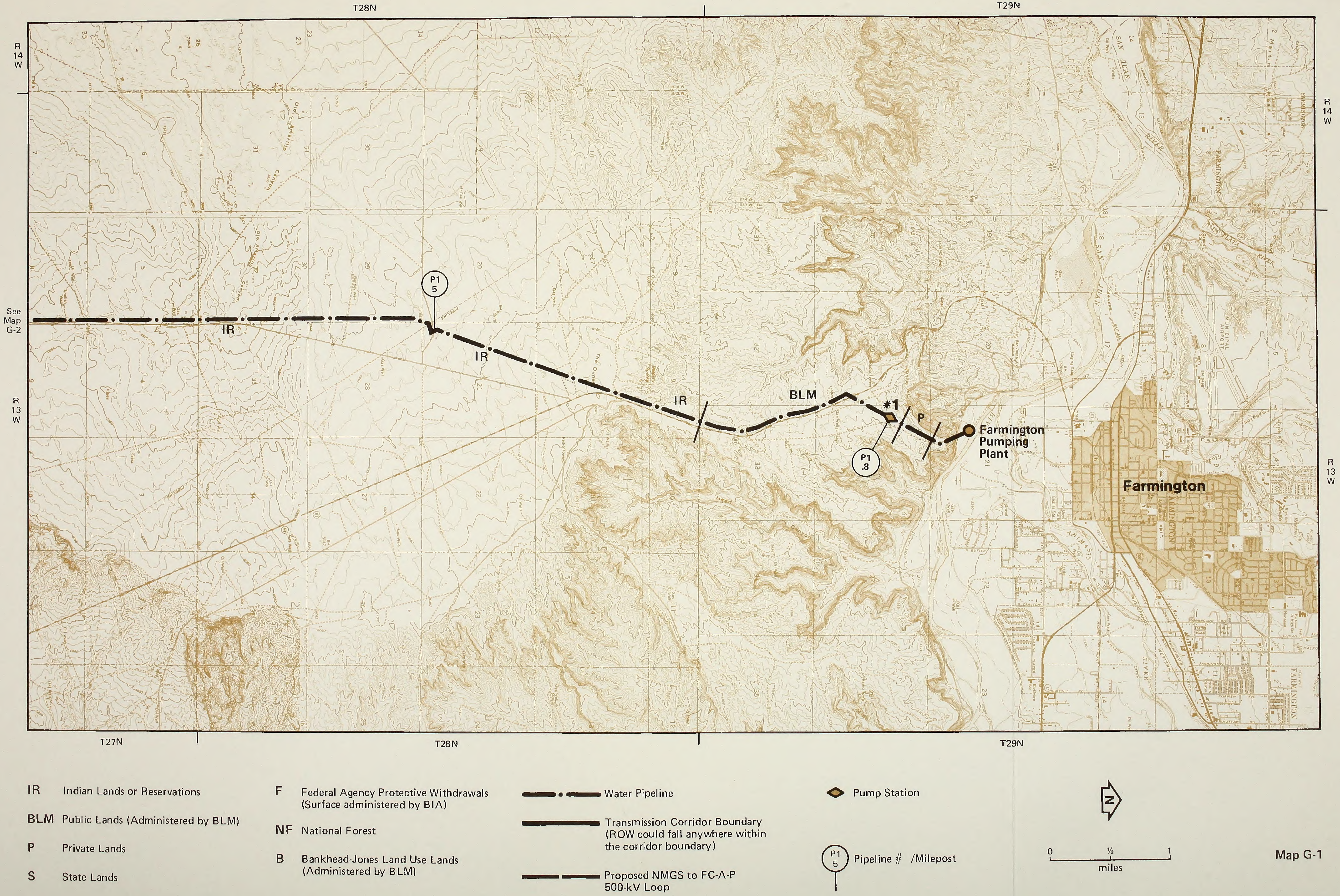
Appendix G

LOCATION MAPS

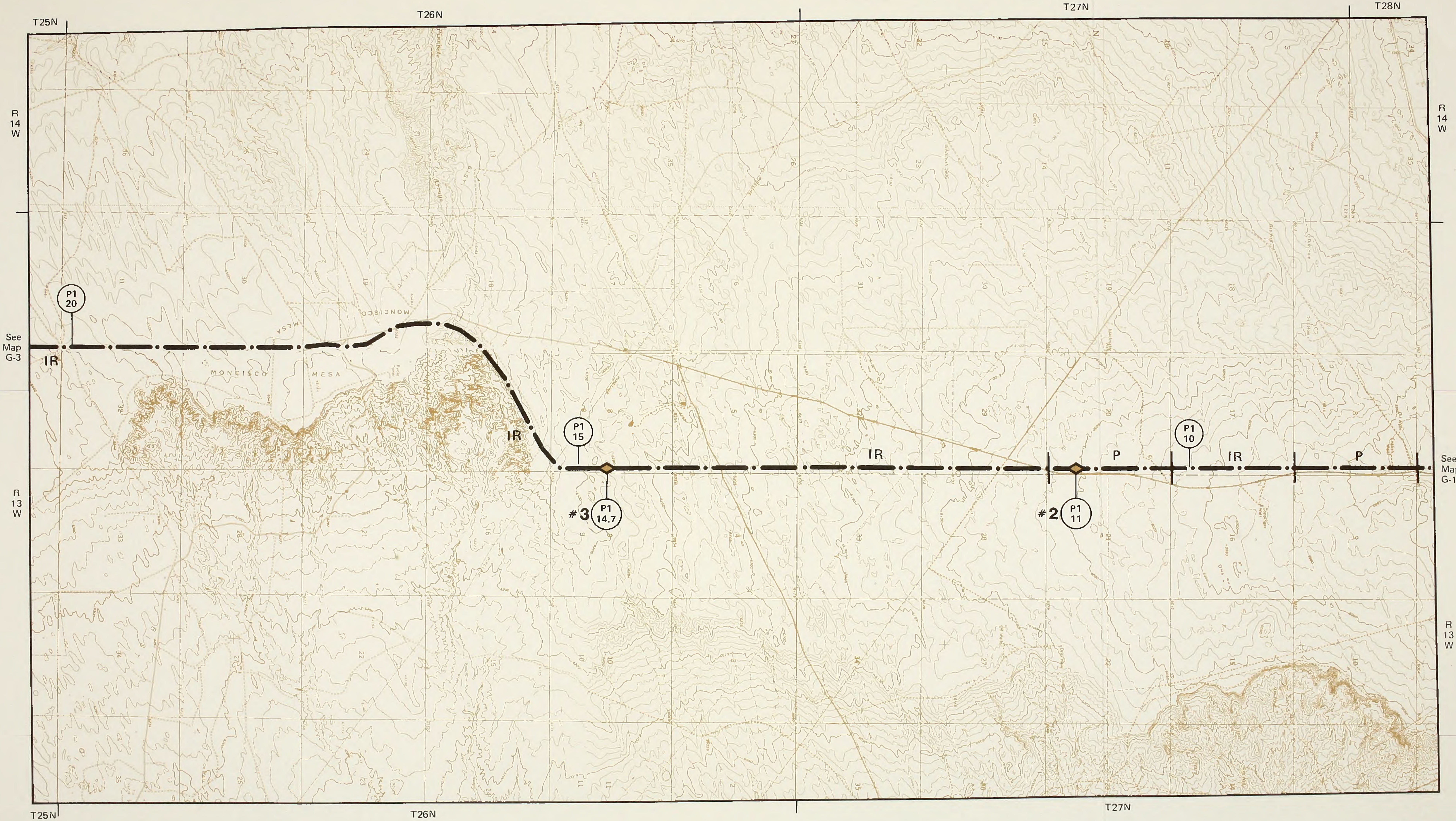


The designation of land status on the following maps is based on BLM surface management status maps. These status designations are approximate and should not be used as a basis for site-specific planning.

INDEX FOR APPENDIX MAPS G-1 THROUGH G-49


T28N
T29N
R 14 W
See Map G-2
R 13 W
P1 5
IR
IR
IR
BLM
#1
P
P1 .8
Farmington Pumping Plant
Farmington
T27N
T28N
T29N
IR Indian Lands or Reservations
BLM Public Lands (Administered by BLM)
P Private Lands
S State Lands
F Federal Agency Protective Withdrawals (Surface administered by BIA)
NF National Forest
B Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
Pump Station
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-1



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

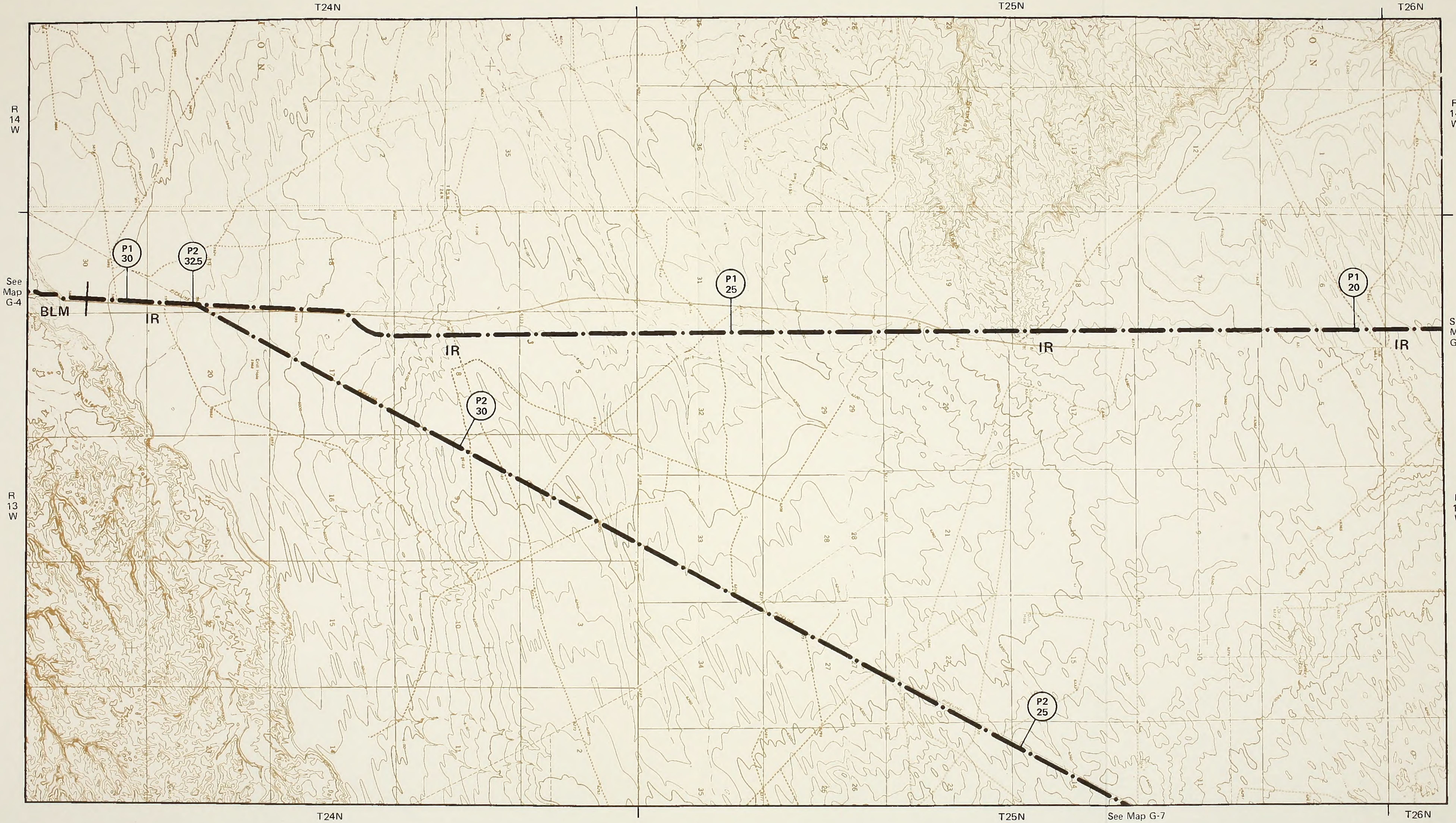
Pump Station

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-2



IR	Indian Lands or Reservations
BLM	Public Lands (Administered by BLM)
P	Private Lands
S	State Lands
F	Federal Agency Protective Withdrawals (Surface administered by BIA)
NF	National Forest
B	Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

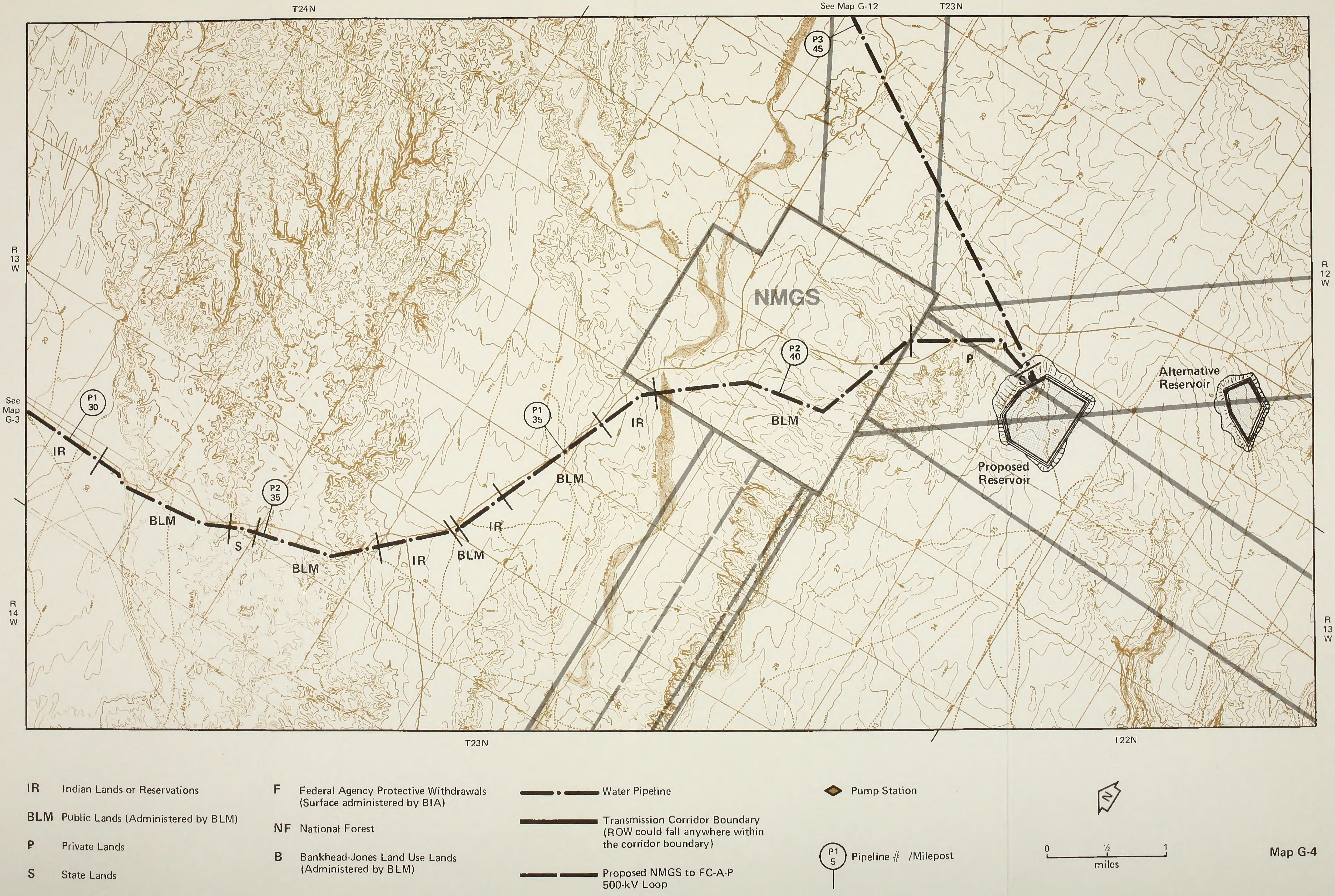
Pump Station

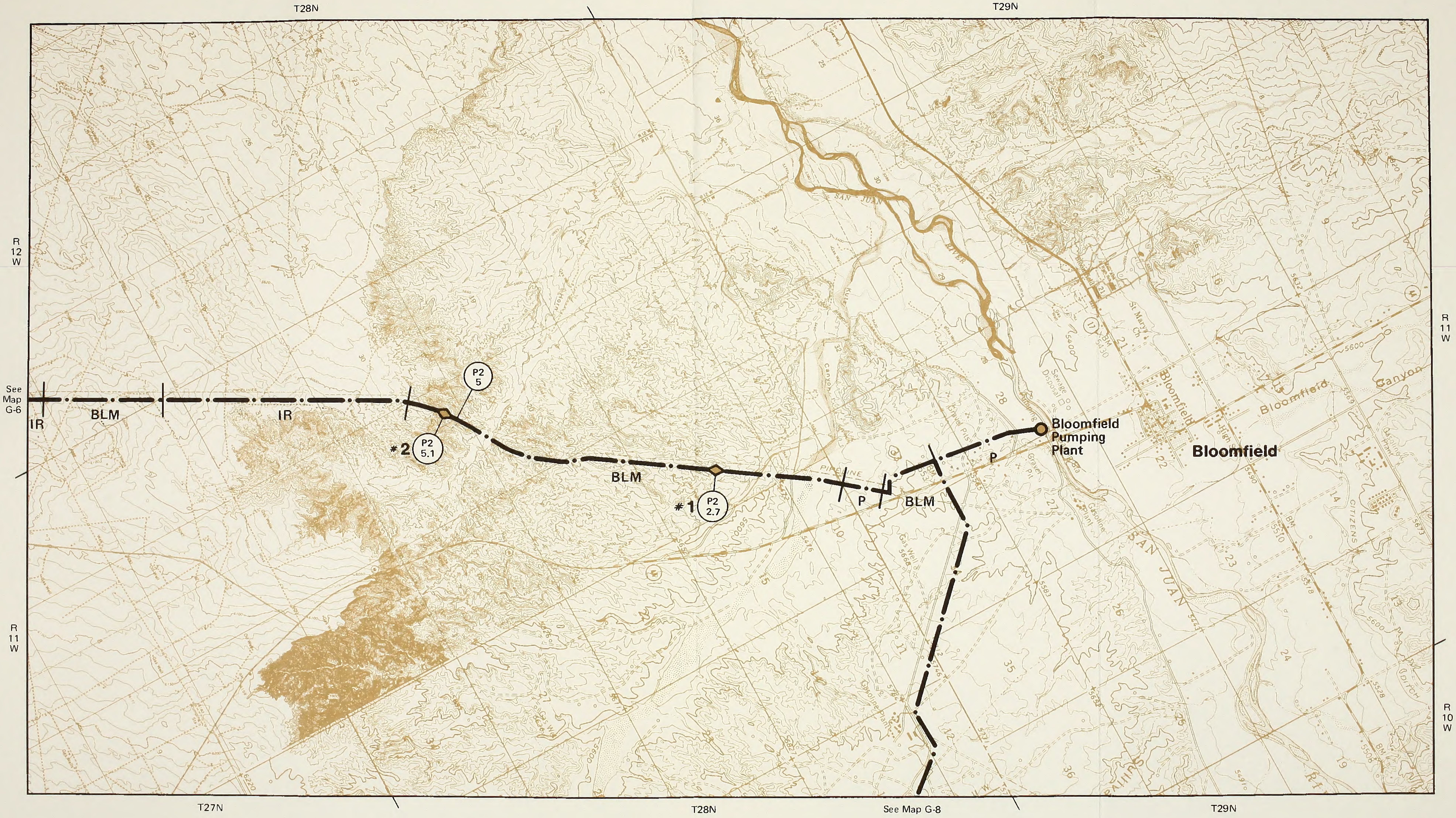
P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-3


T24N
See Map G-12
T23N
R 13 W
R 12 W
R 14 W
R 13 W
See Map G-3
T23N
T22N
NMGS
P3 45
P2 40
P1 30
P1 35
P2 35
IR
BLM
S
IR
BLM
IR
BLM
IR
BLM
IR
BLM
P
S
Alternative Reservoir
Proposed Reservoir
IR Indian Lands or Reservations
BLM Public Lands (Administered by BLM)
P Private Lands
S State Lands
F Federal Agency Protective Withdrawals (Surface administered by BIA)
NF National Forest
B Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
Pump Station
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles
Map G-4



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

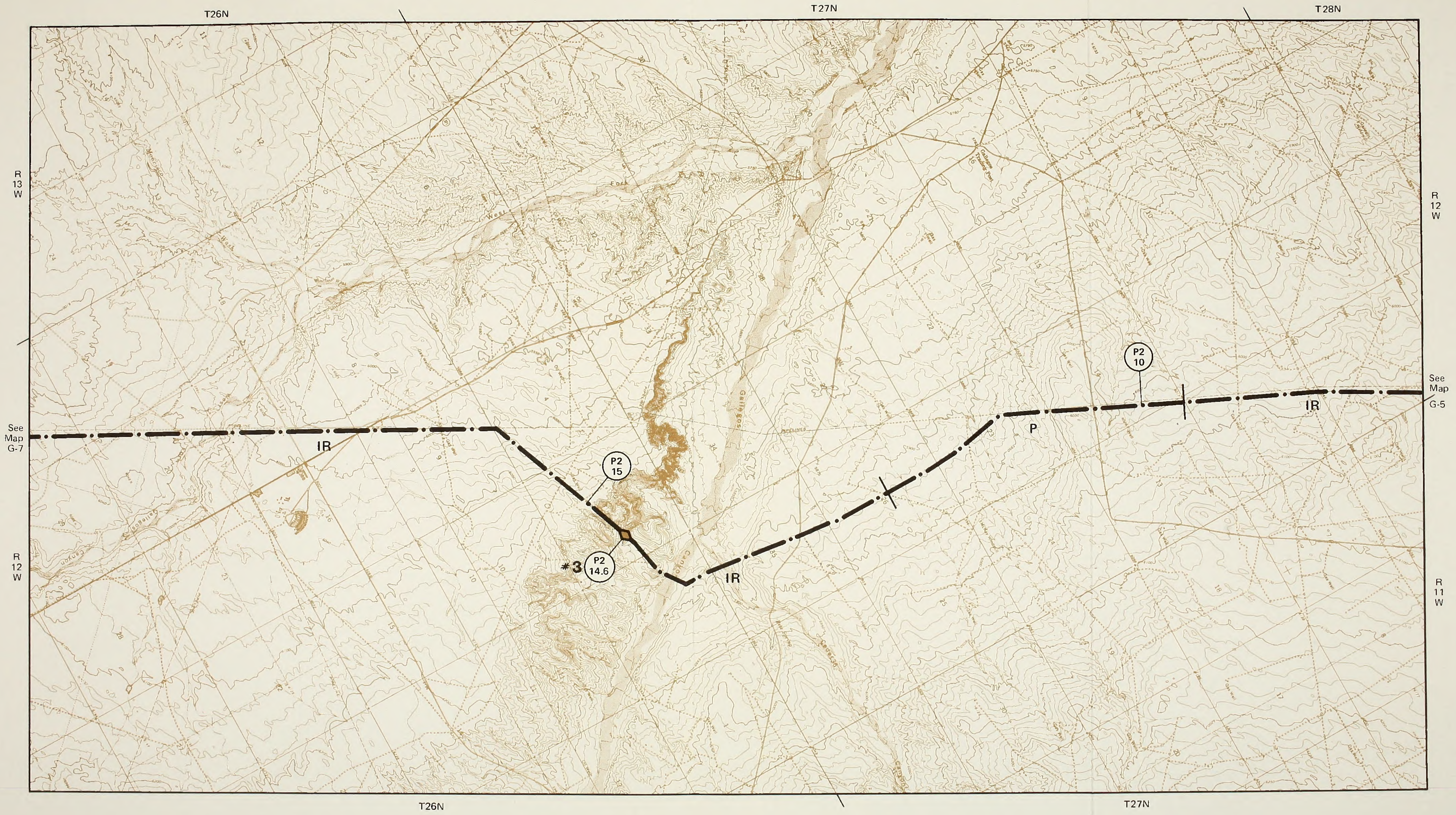
Proposed NMGS to FC-A-P 500-kV Loop

Pump Station

P1 5 Pipeline # /Milepost

0 ½ 1 miles

Map G-5



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

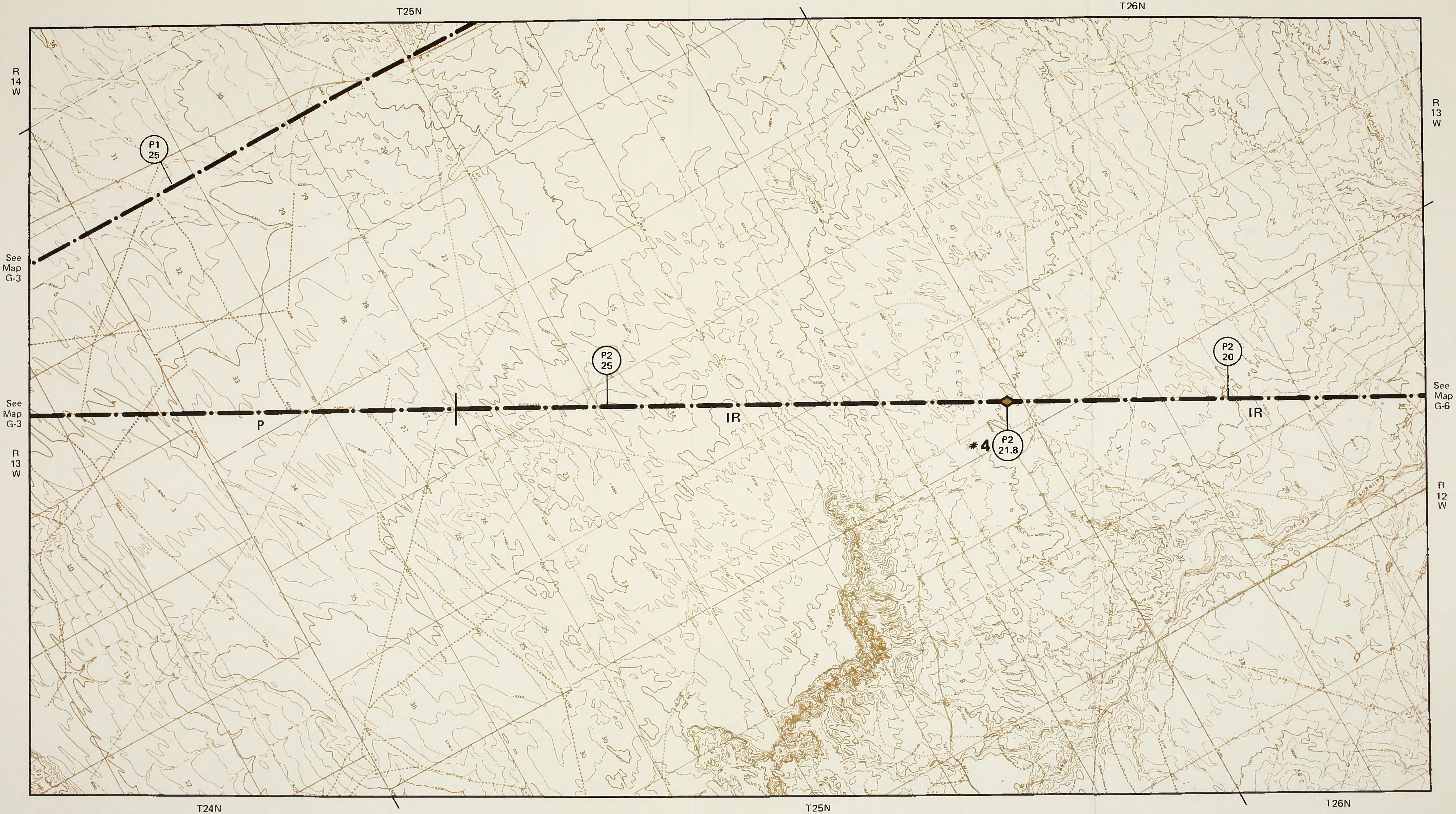
Pump Station

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-6



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

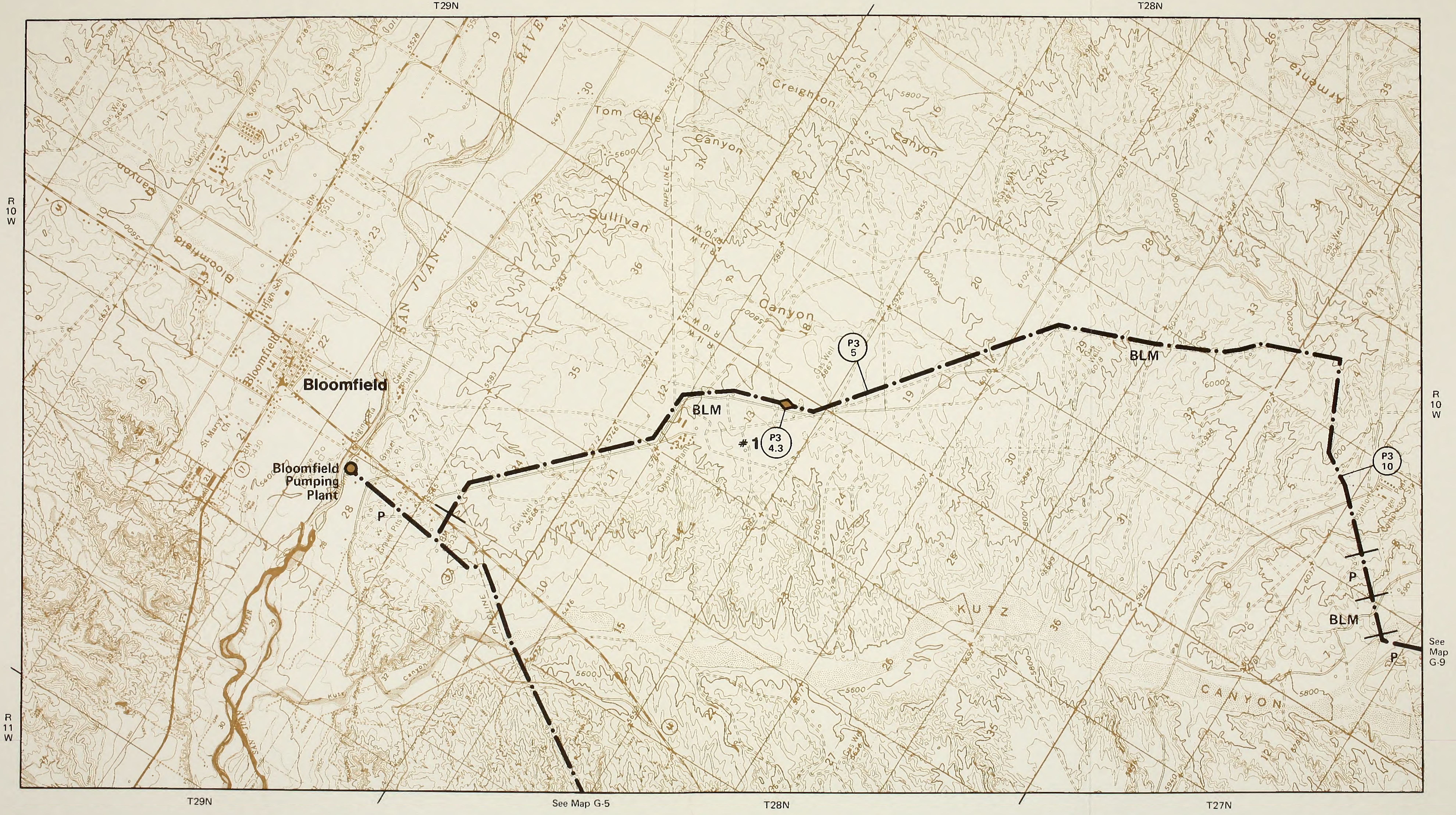
Pump Station

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-7



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

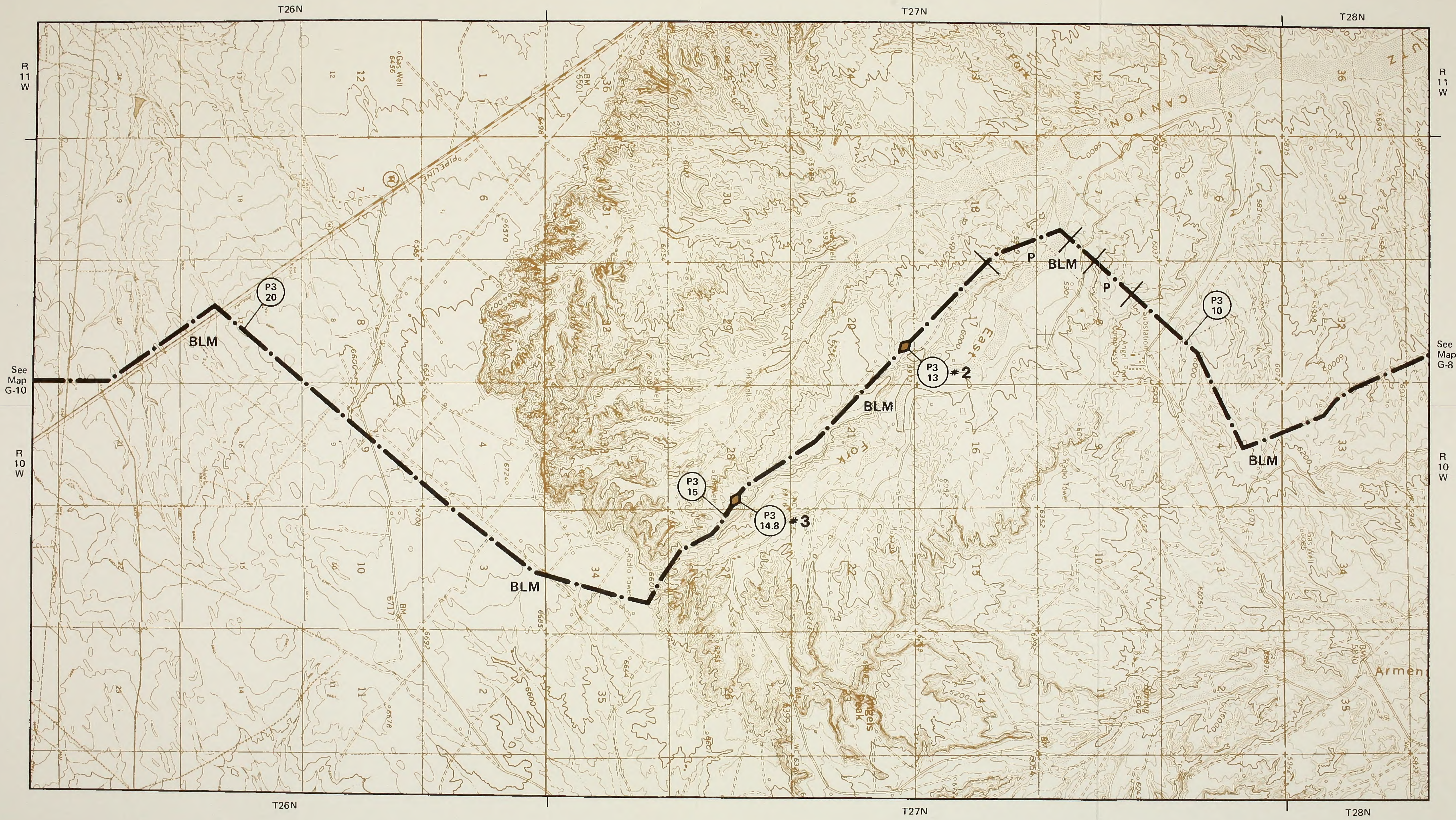
Proposed NMGS to FC-A-P 500-kV Loop

Pump Station

P1 5 Pipeline # /Milepost

0 ½ 1 miles

Map G-8



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

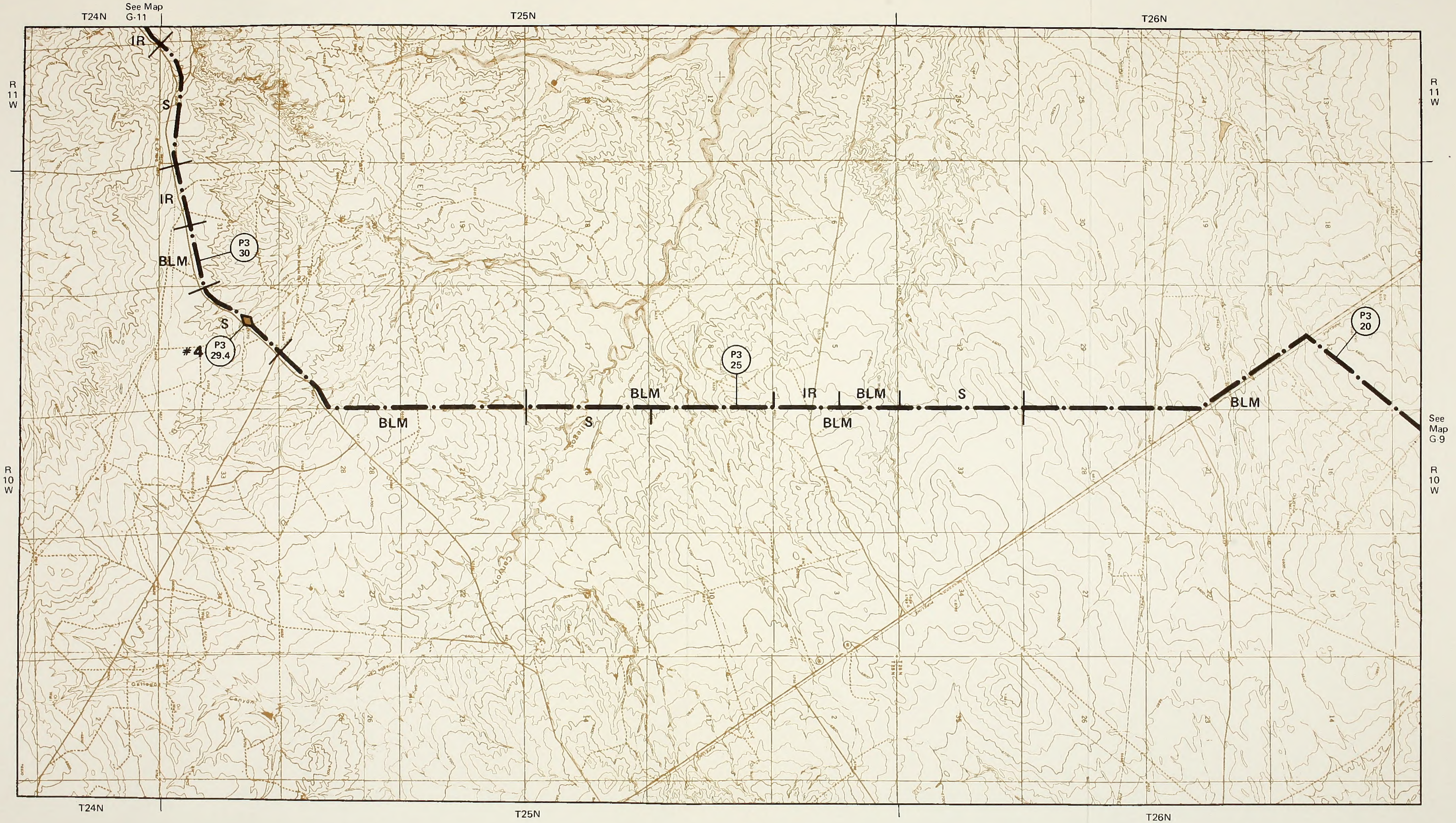
Pump Station

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-9



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

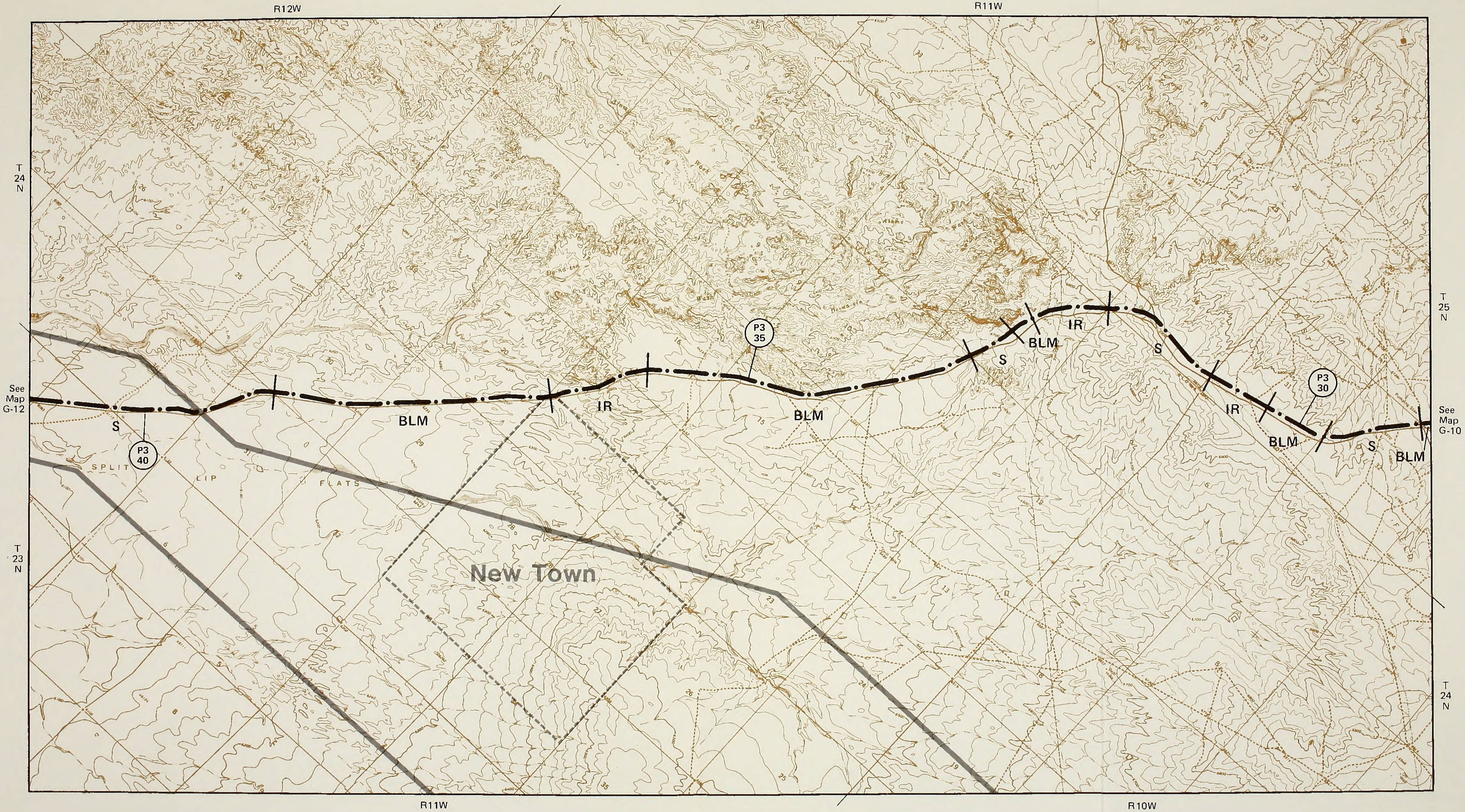
Pump Station

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-10



IR Indian Lands or Reservations

BLM Public Lands (Administered by BLM)

P Private Lands

S State Lands

F Federal Agency Protective Withdrawals (Surface administered by BIA)

NF National Forest

B Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

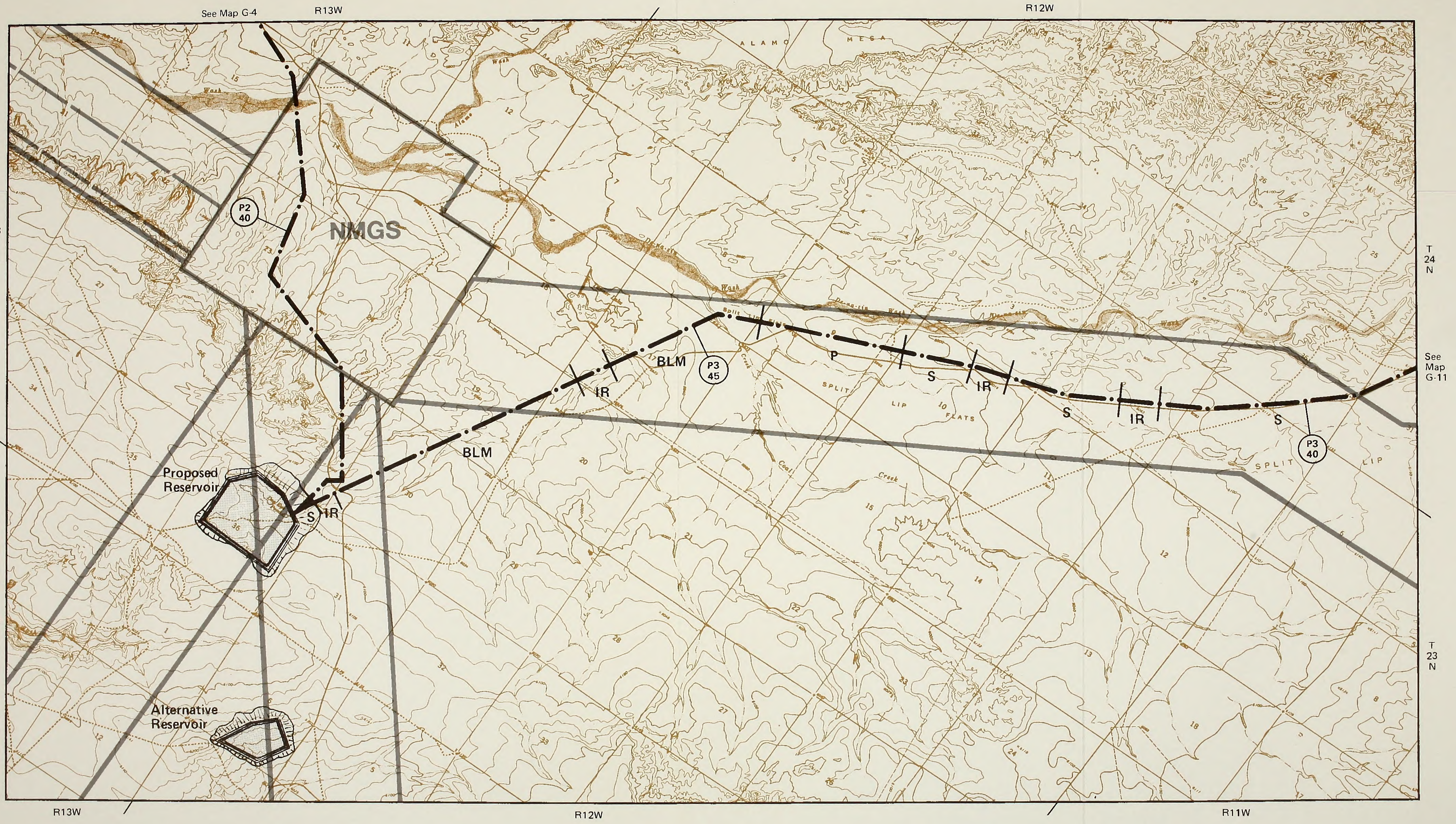
Pump Station

P1 5 Pipeline # /Milepost

0 ½ 1
miles

N

Map G-11

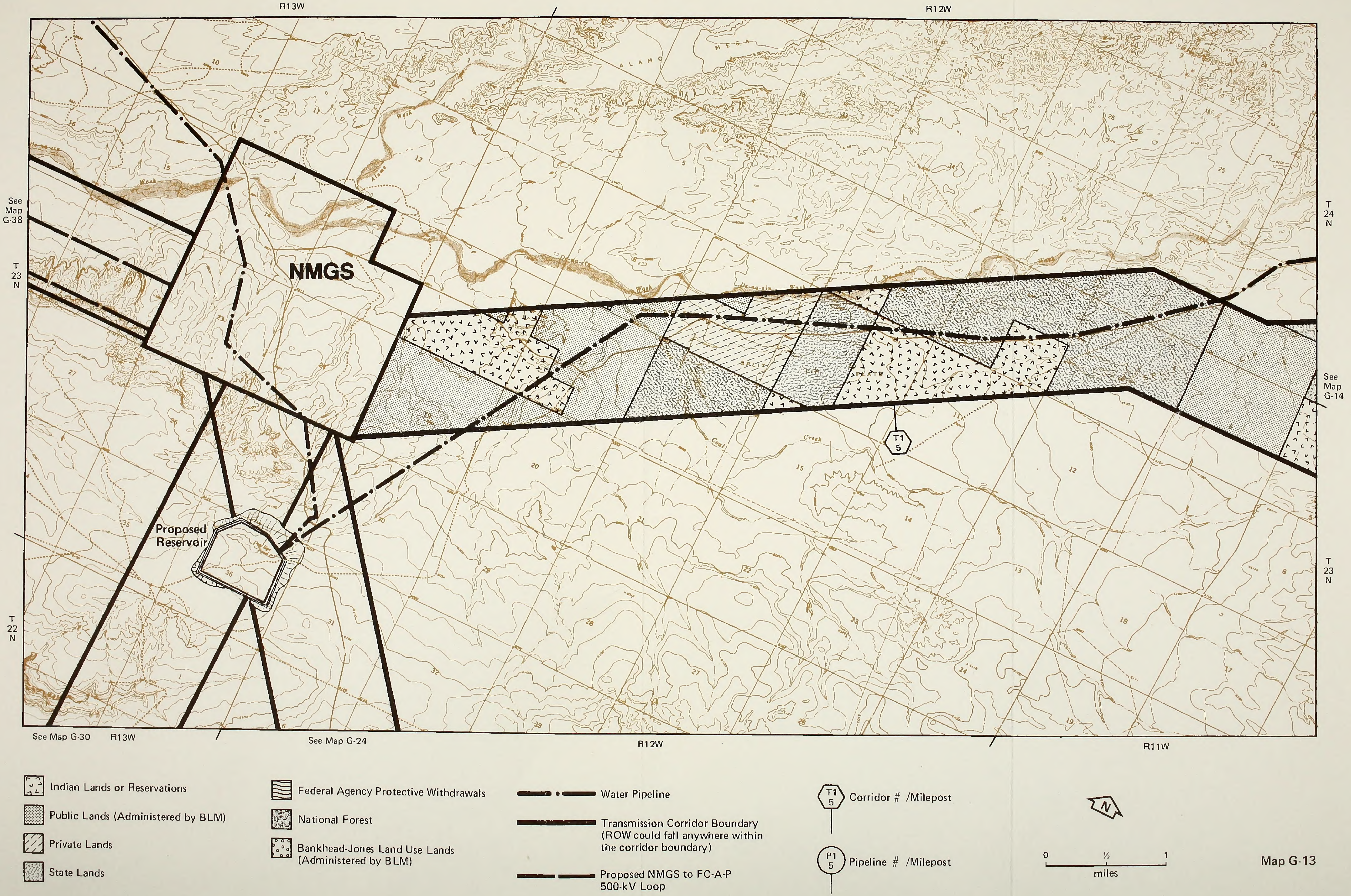


IR	Indian Lands or Reservations	F	Federal Agency Protective Withdrawals (Surface administered by BIA)	Water Pipeline	Pump Station
BLM	Public Lands (Administered by BLM)	NF	National Forest	Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)	
P	Private Lands	B	Bankhead-Jones Land Use Lands (Administered by BLM)	Proposed NMGS to FC-A-P 500-kV Loop	P1 5 Pipeline # /Milepost
S	State Lands				

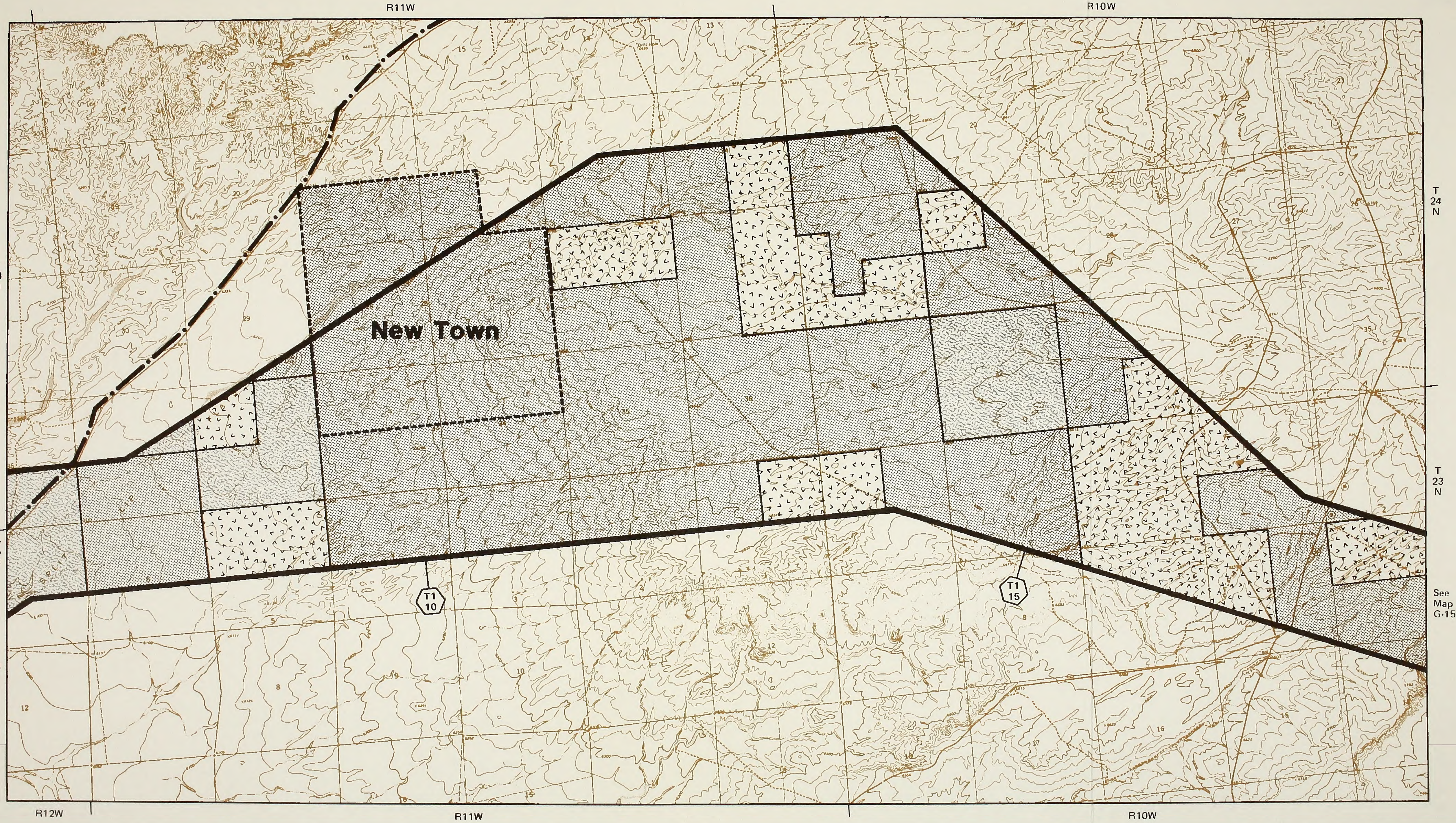
N

0 ½ 1
miles

Map G-12


R13W
R12W
R11W
T 24 N
T 23 N
T 22 N
See Map G-38
See Map G-14
See Map G-30
See Map G-24
ALAMO MESA
NMGS
Proposed Reservoir
T1 5
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
Corridor # /Milepost
Pipeline # /Milepost
N
0 ½ 1
miles

Map G-13



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

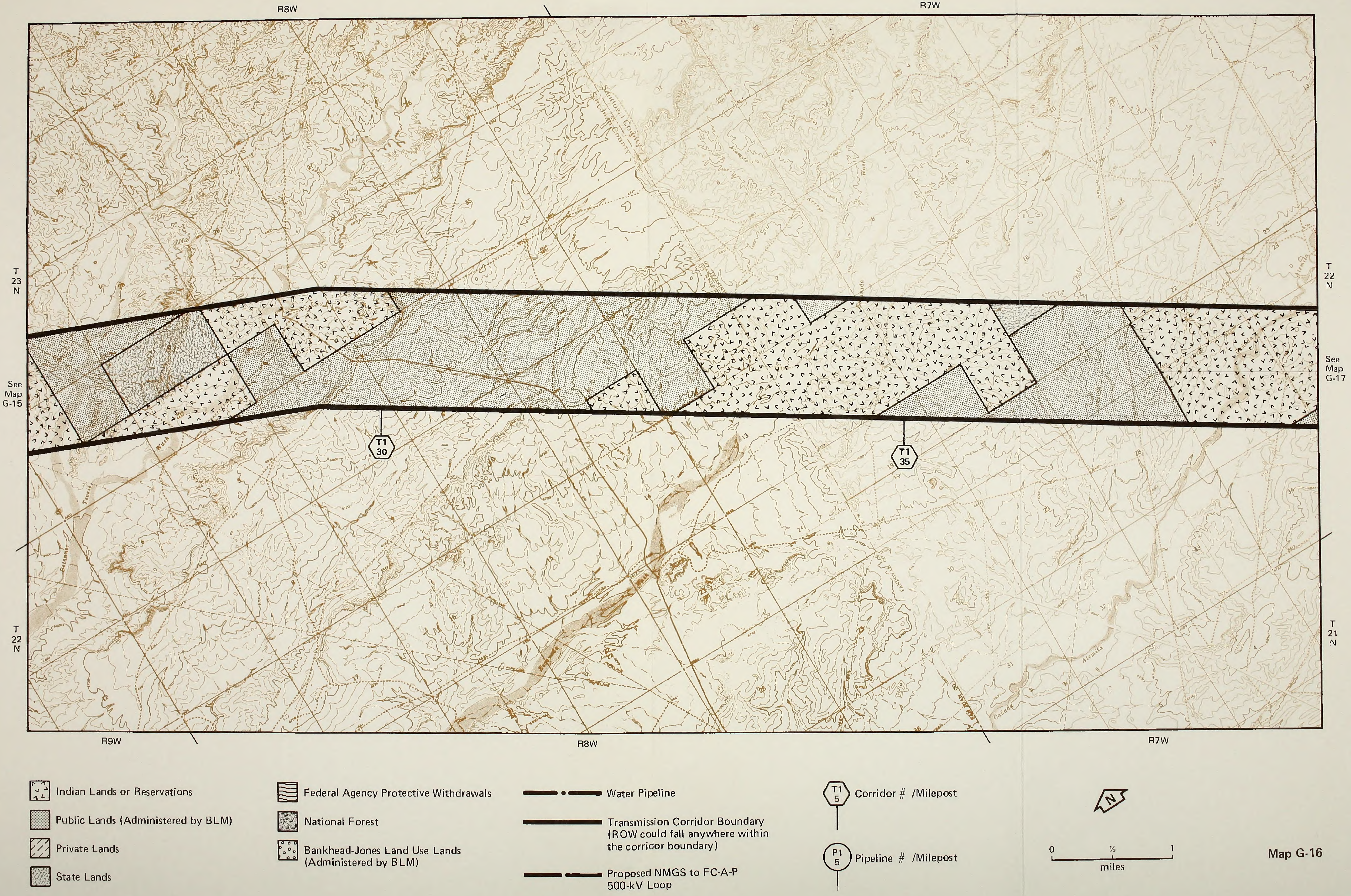
N

0 ½ 1 miles

Map G-14

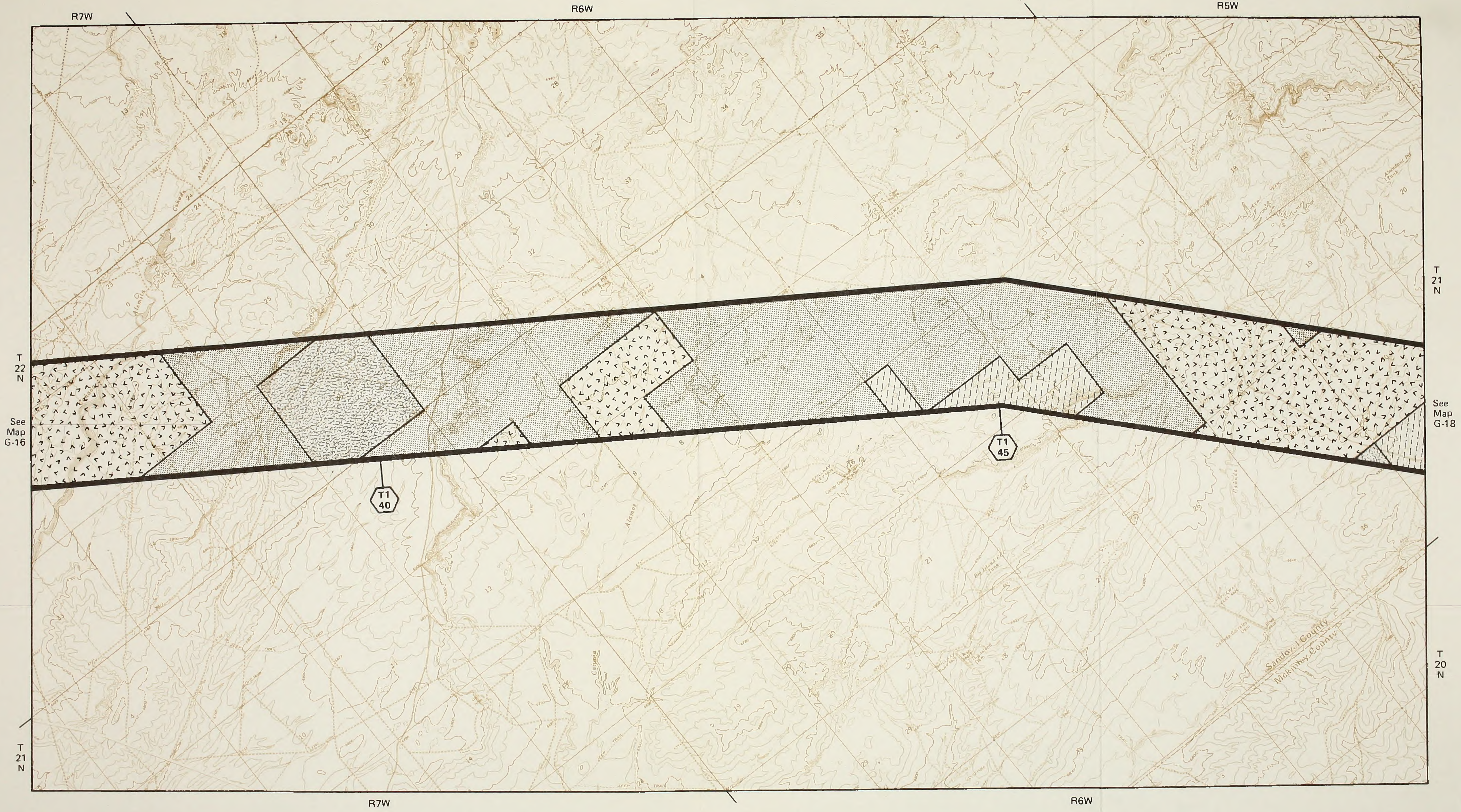
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-15



R8W
R7W
T 23 N
T 22 N
See Map G-15
See Map G-17
T1 30
T1 35
T 22 N
T 21 N
R9W
R8W
R7W
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-16



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

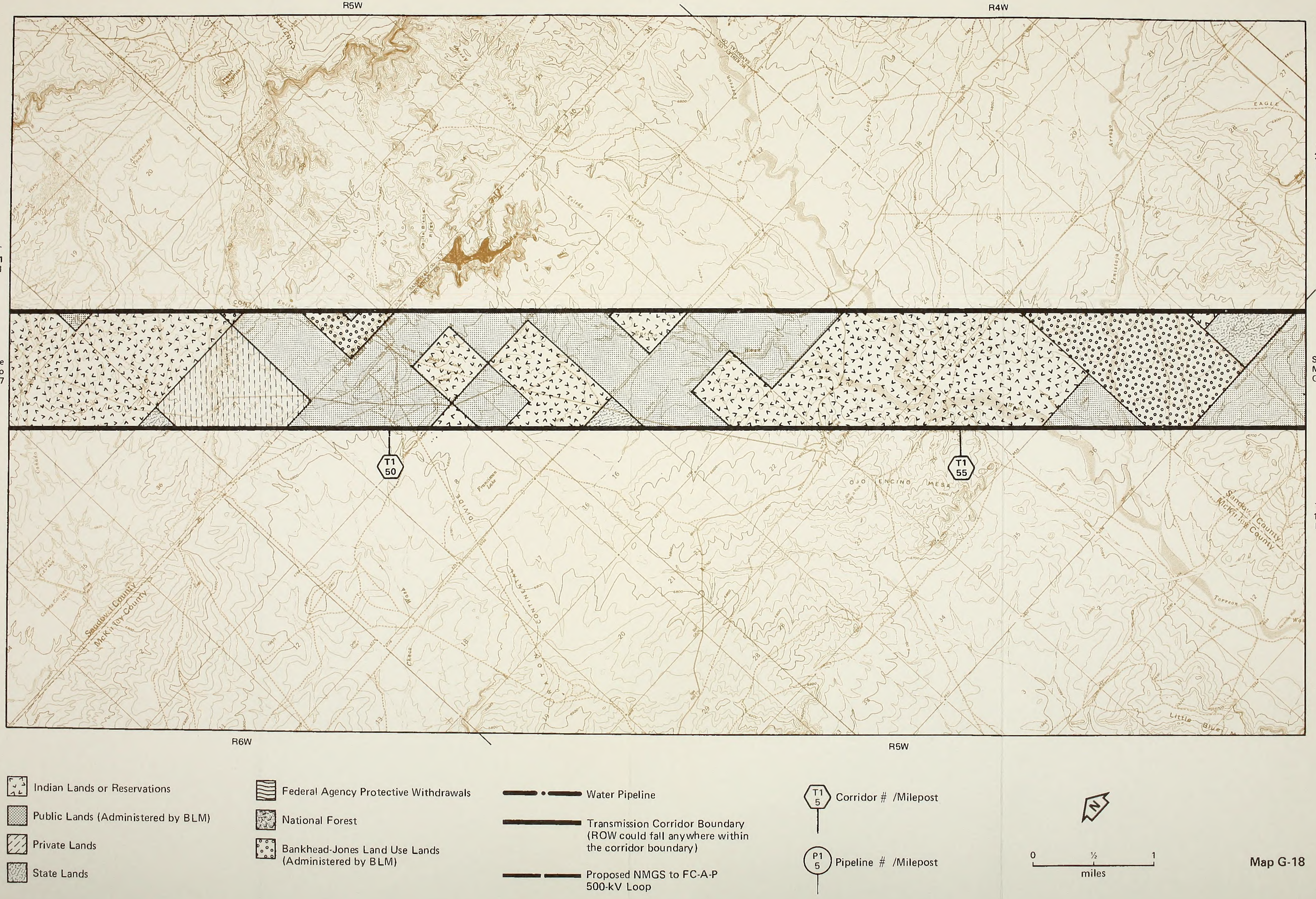
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

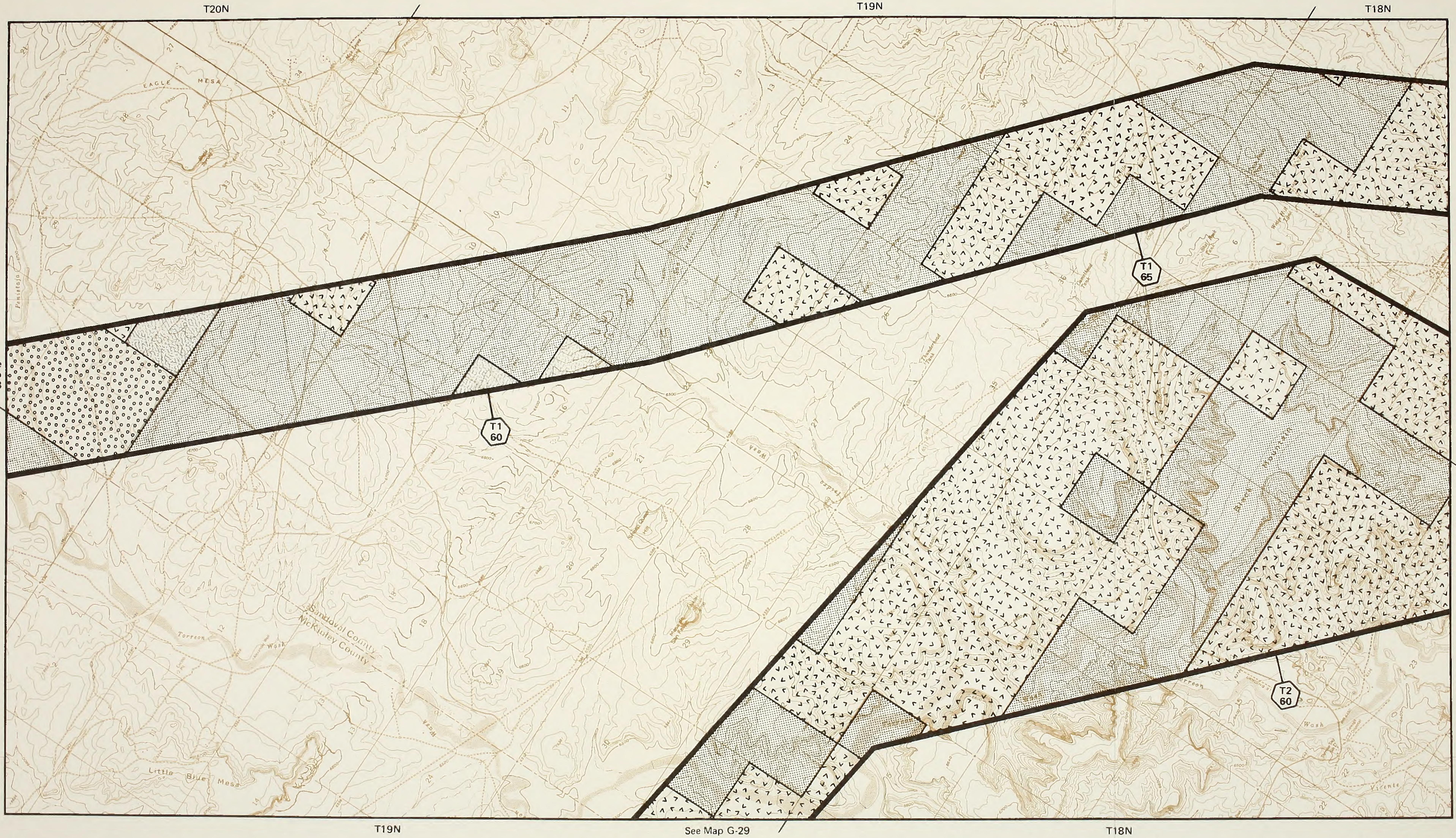
N

0 ½ 1 miles

Map G-17


R5W
R4W
T 21 N
T 20 N
T 19 N
See Map G-17
See Map G-19
T1 50
T1 55
OJO ENCINO MESA
Sandoval County
McKinley County
R6W
R5W
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-18



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

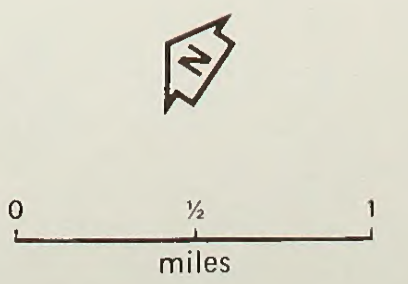
Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

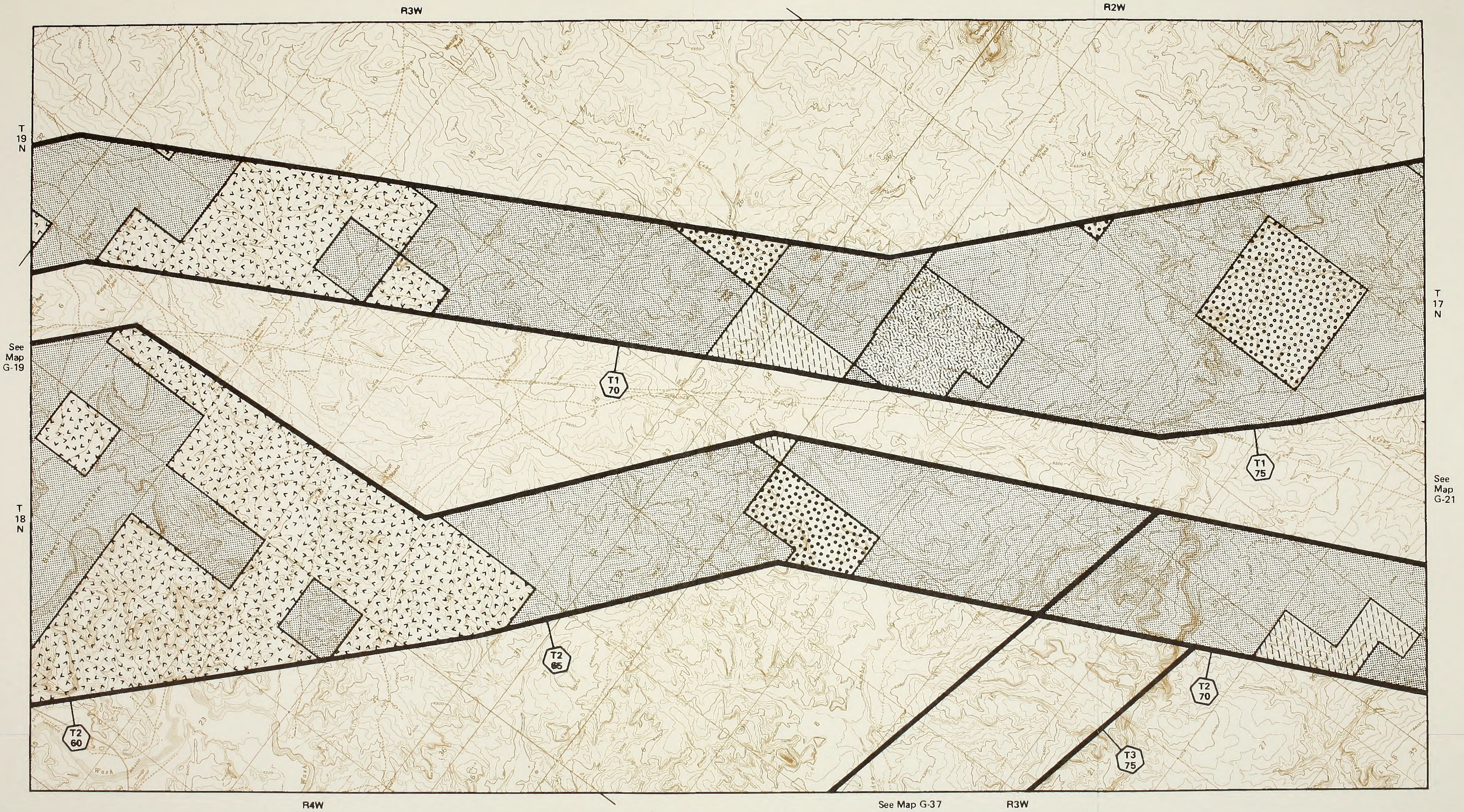
Proposed NMGS to FC-A-P 500-kV Loop

T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost



Map G-19



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

T1 5 Corridor # /Milepost

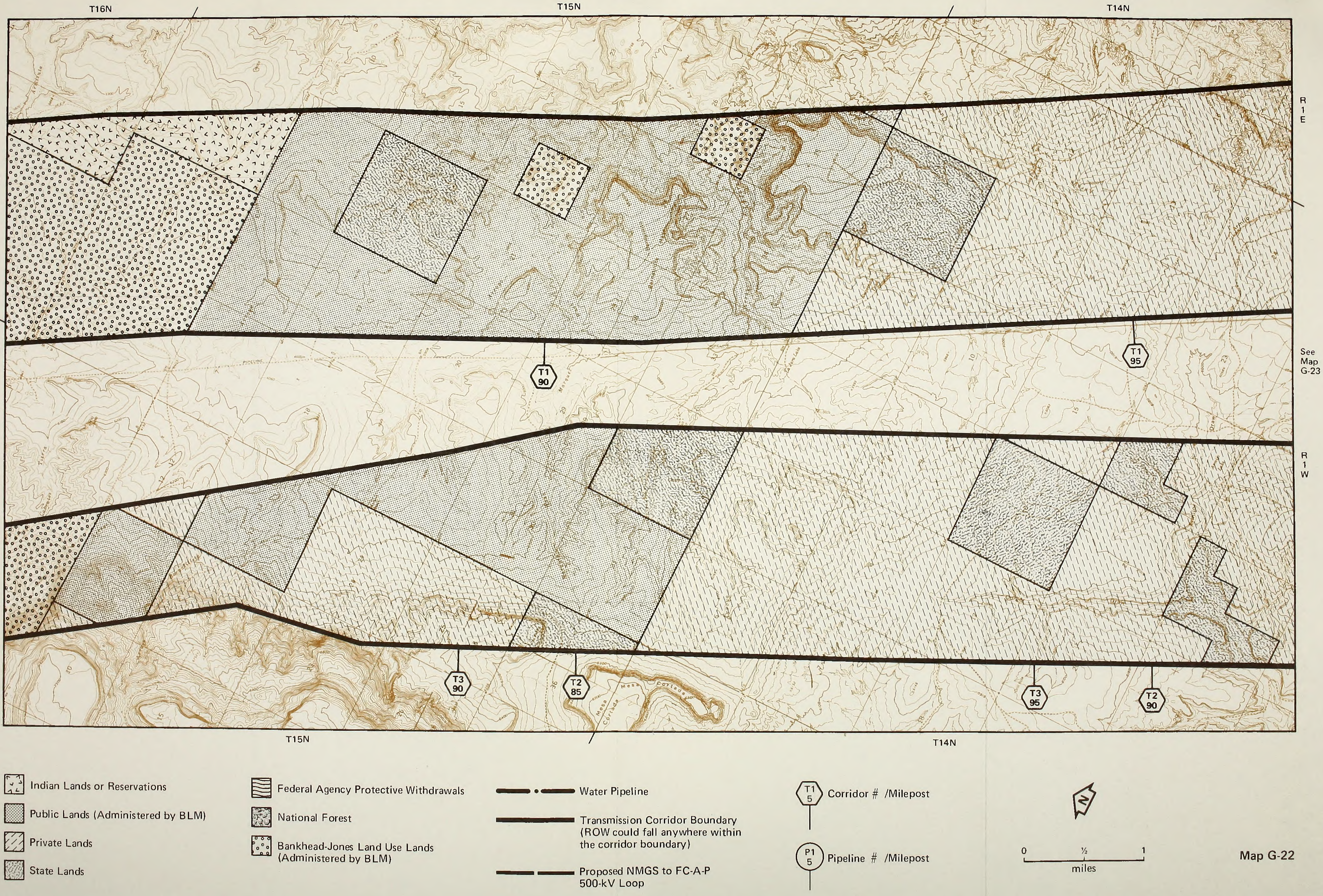
P1 5 Pipeline # /Milepost

0 ½ 1 miles

Map G-20


T17N
T16N
R 2 W
R 1 W
See Map G-20
See Map G-22
R 3 W
R 2 W
T1 80
T1 85
T3 80
T2 75
T3 85
T2 80
T16N
T15N
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0
½
1
miles

Map G-21


T16N
T15N
T14N
R 1 E
R 1 W
R 2 W
R 1 W
See Map G-21
See Map G-23
T1 90
T1 95
T3 90
T2 85
T3 95
T2 90
T15N
T14N
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
0 ½ 1
miles
N

Map G-22

Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

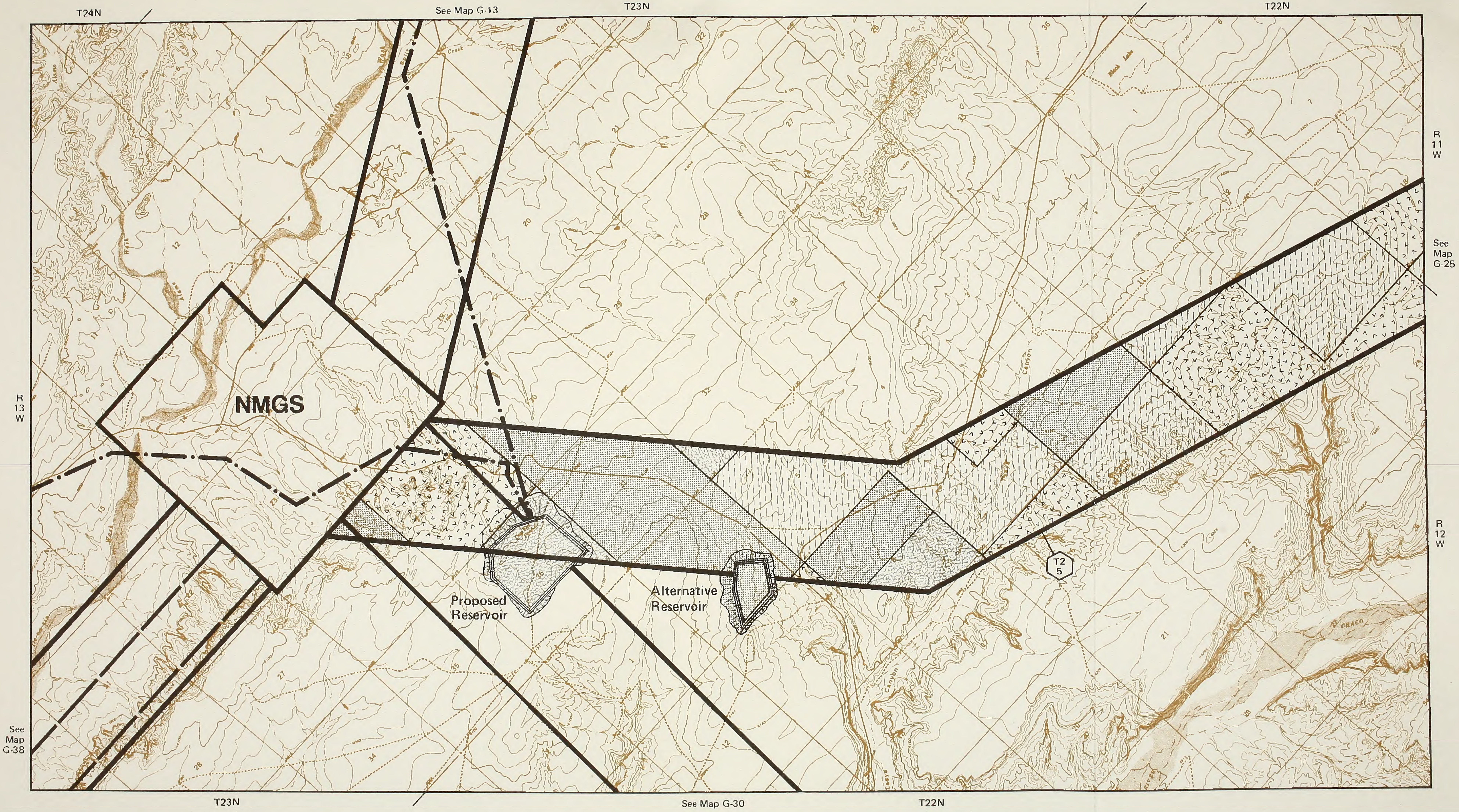
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-23



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

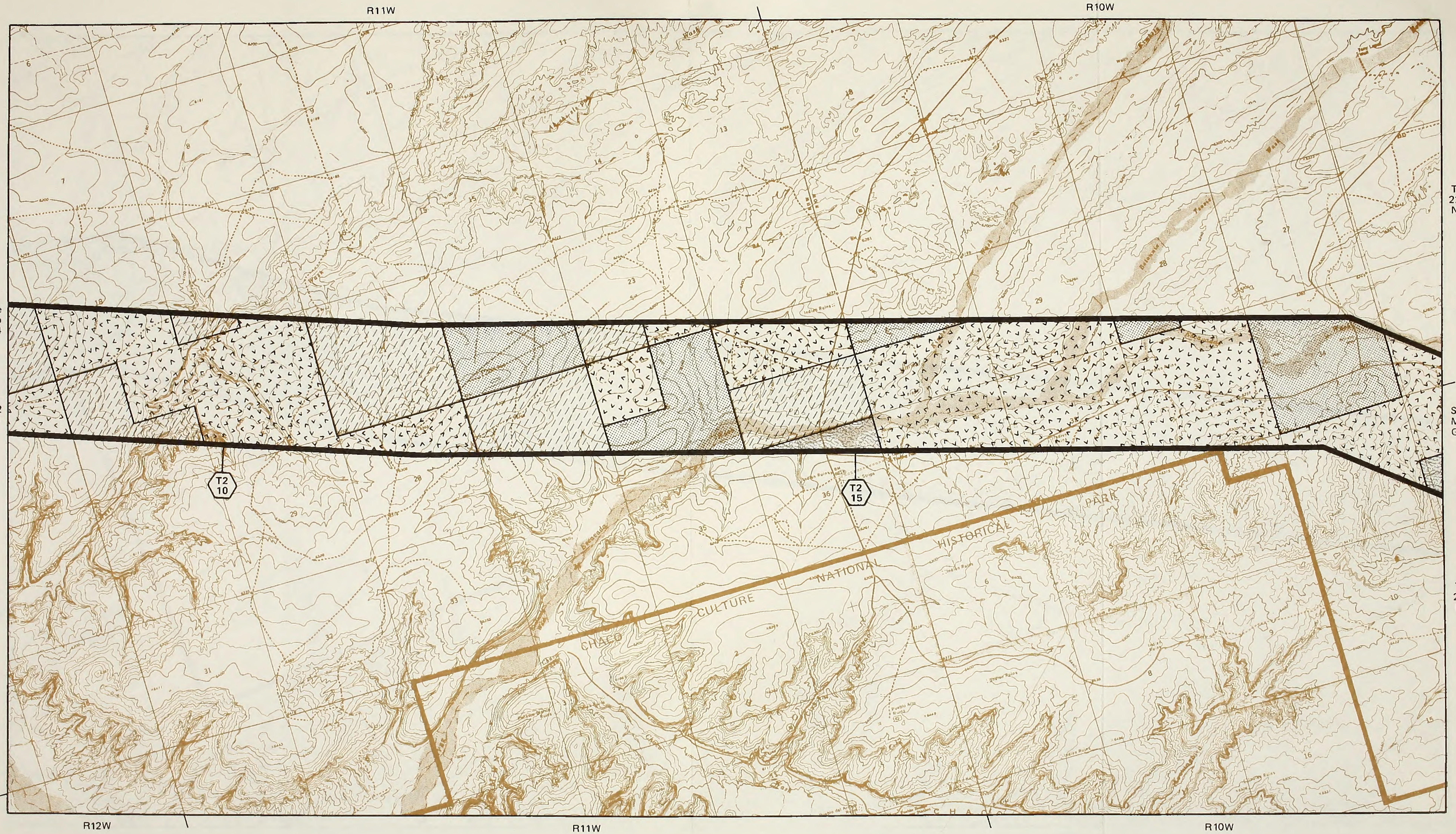
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-24



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

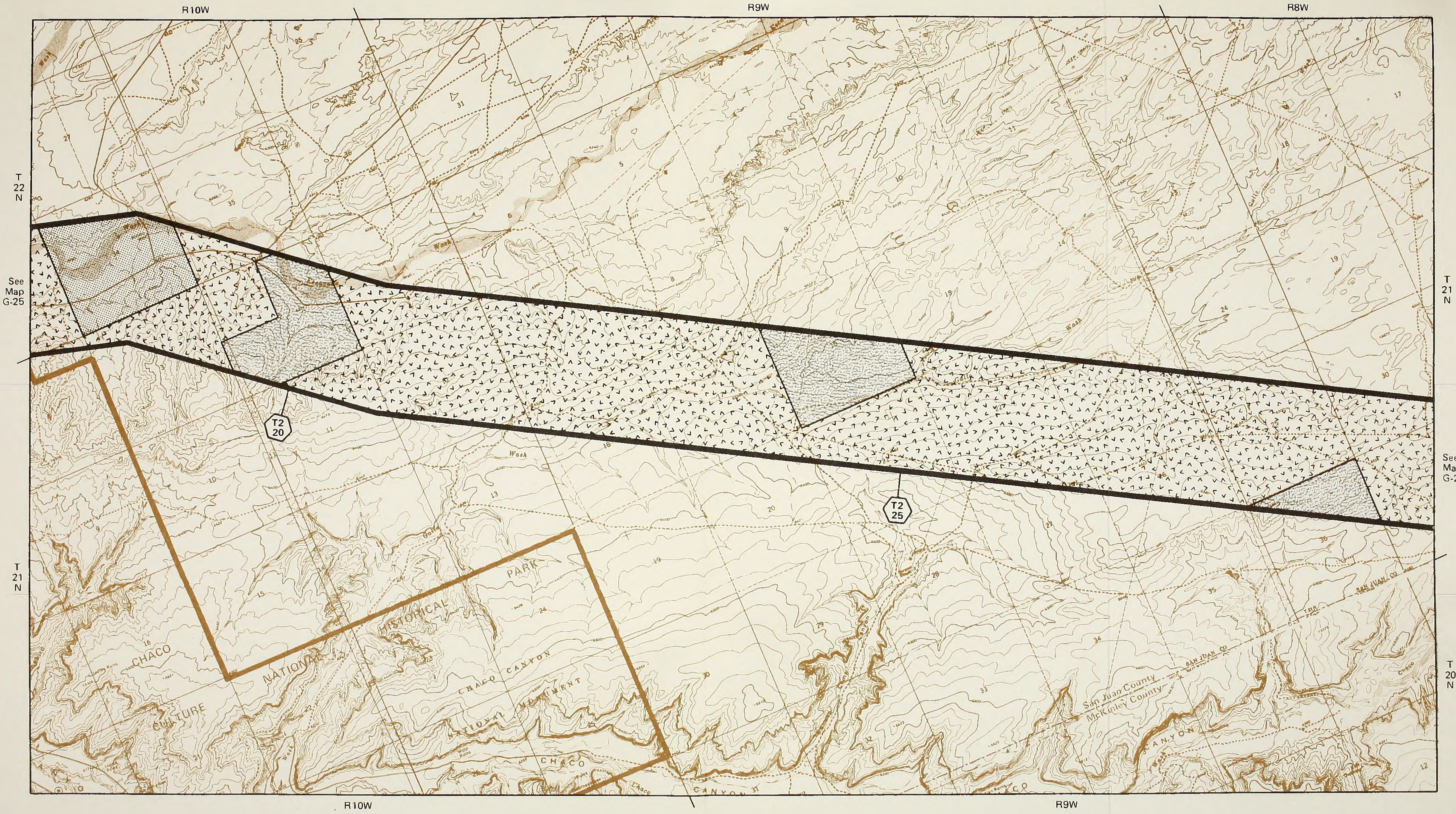
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-25



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

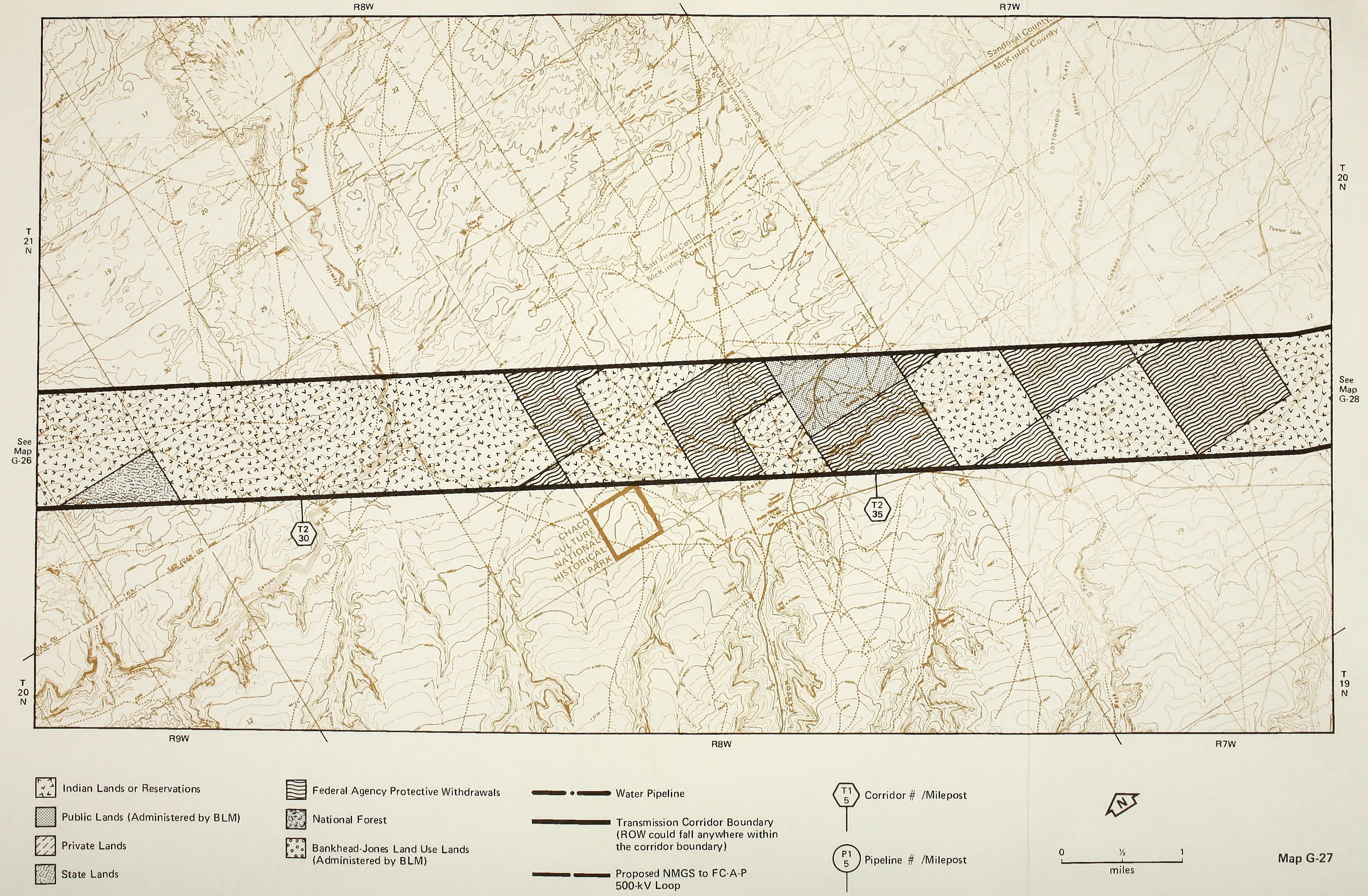
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

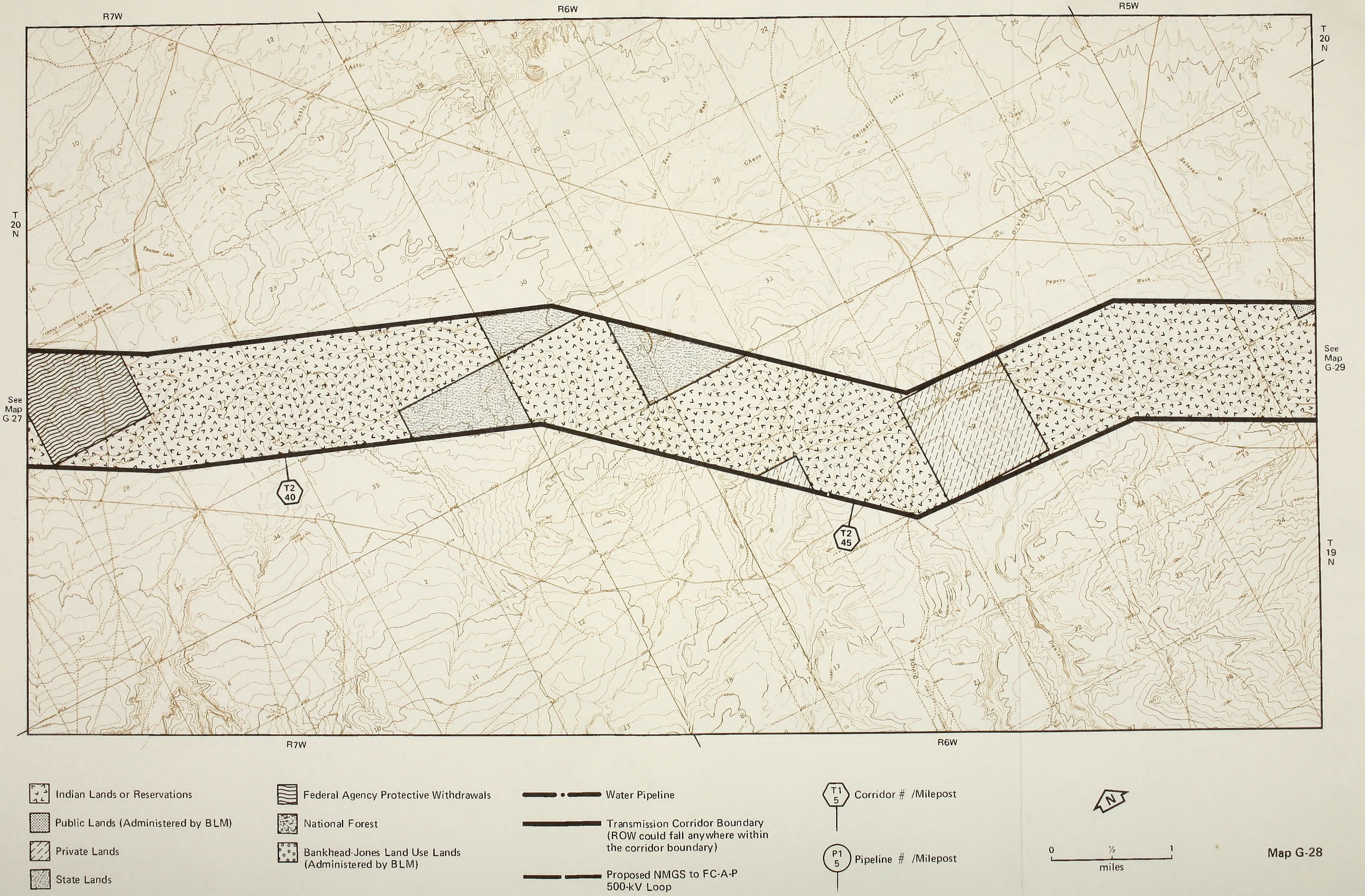
N

0 ½ 1
miles

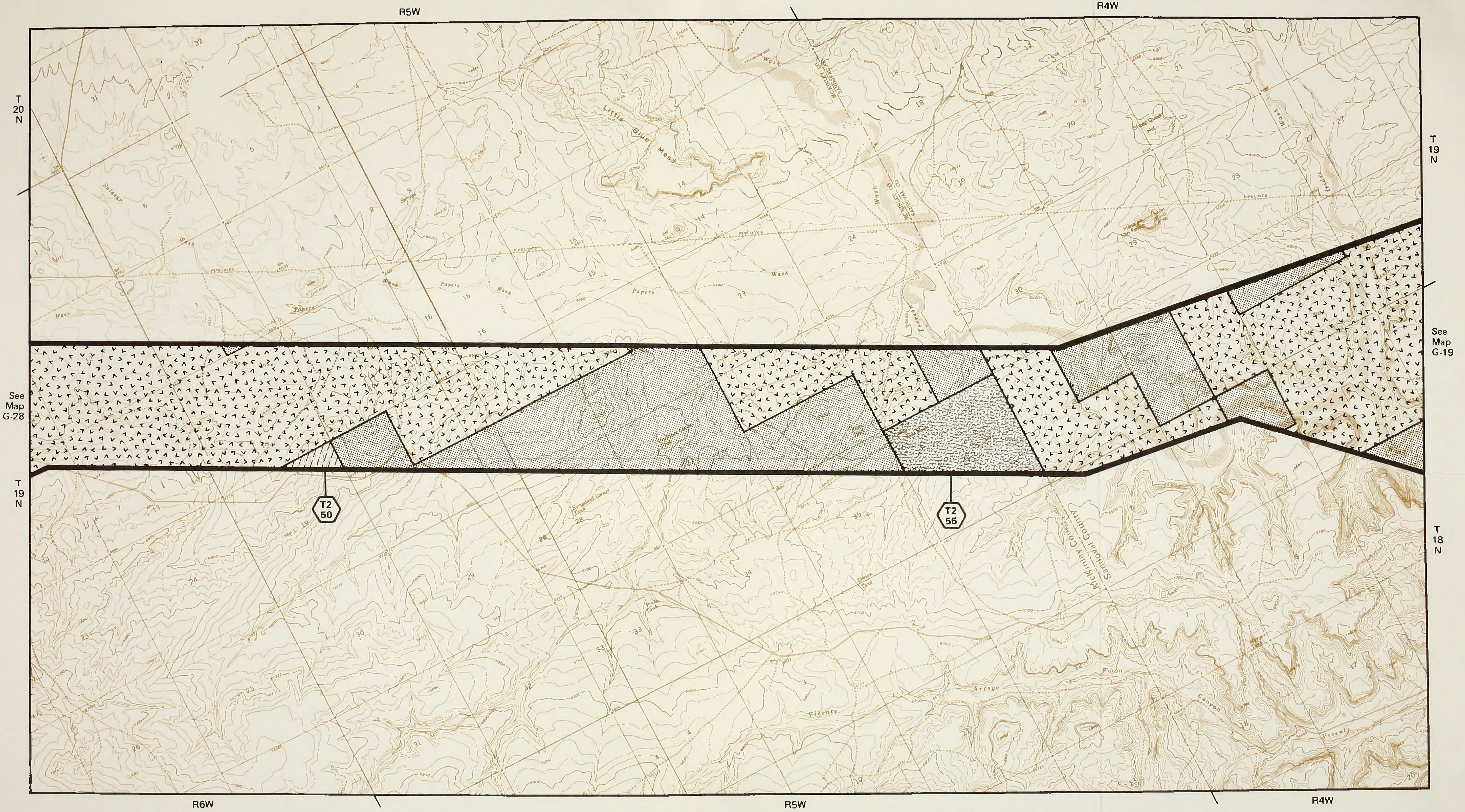
Map G-26


R8W
R7W
T 21 N
T 20 N
T 19 N
R9W
R8W
R7W
See Map G-26
See Map G-28
Sandoval County
McKinley County
San Juan County
McKinley County
CHACO CULTURE NATIONAL HISTORICAL PARK
COTTONWOOD
FLATS
Tanner Lake
T2 30
T2 35
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0
½
1
miles

Map G-27


R7W
R6W
R5W
T 20 N
T 19 N
See Map G-27
See Map G-29
T2 40
T2 45
CONTINENTAL DIVIDE
Tanner Lake
Chaco Wash
Papers Wash
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-28



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

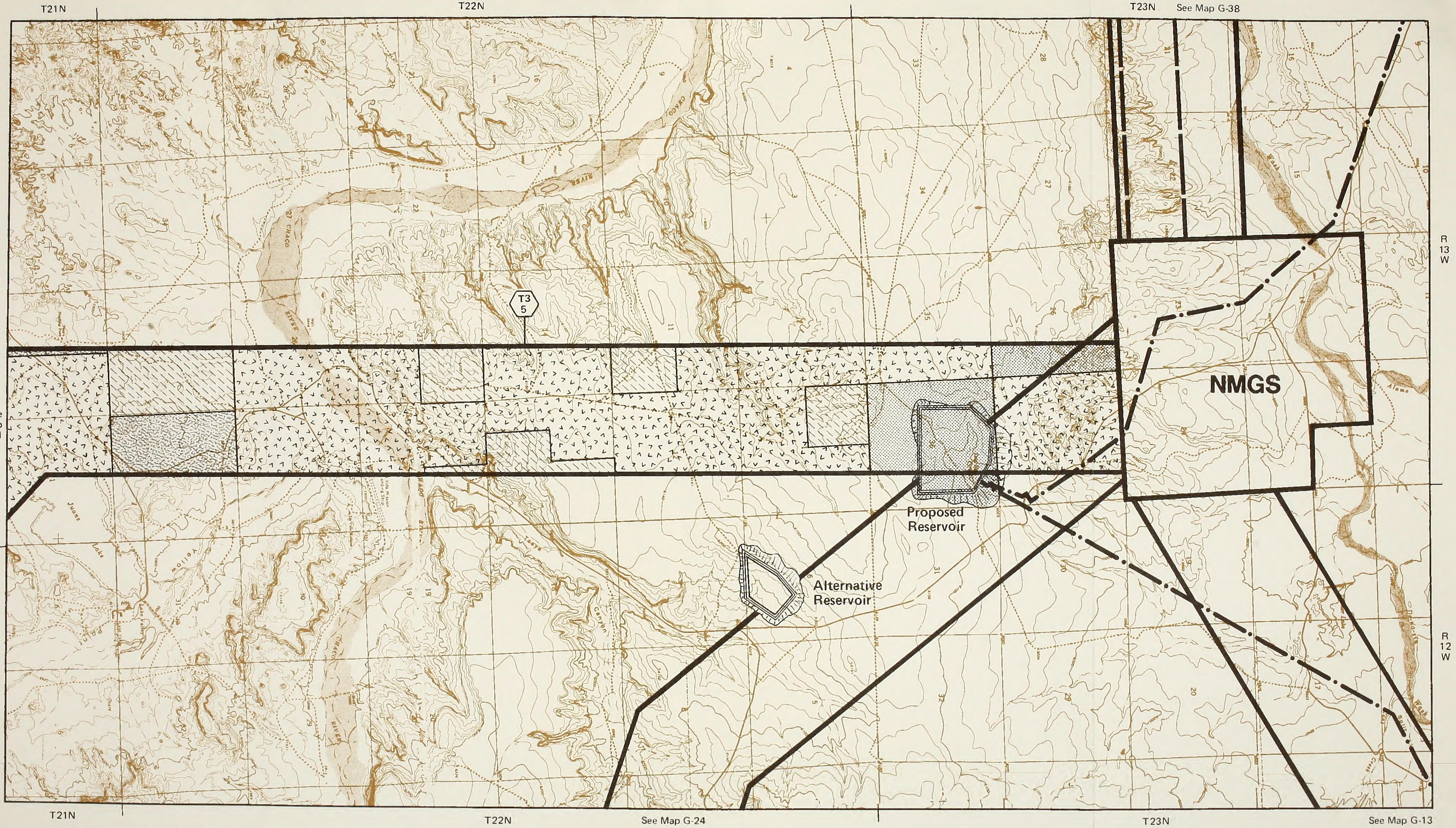
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-29



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

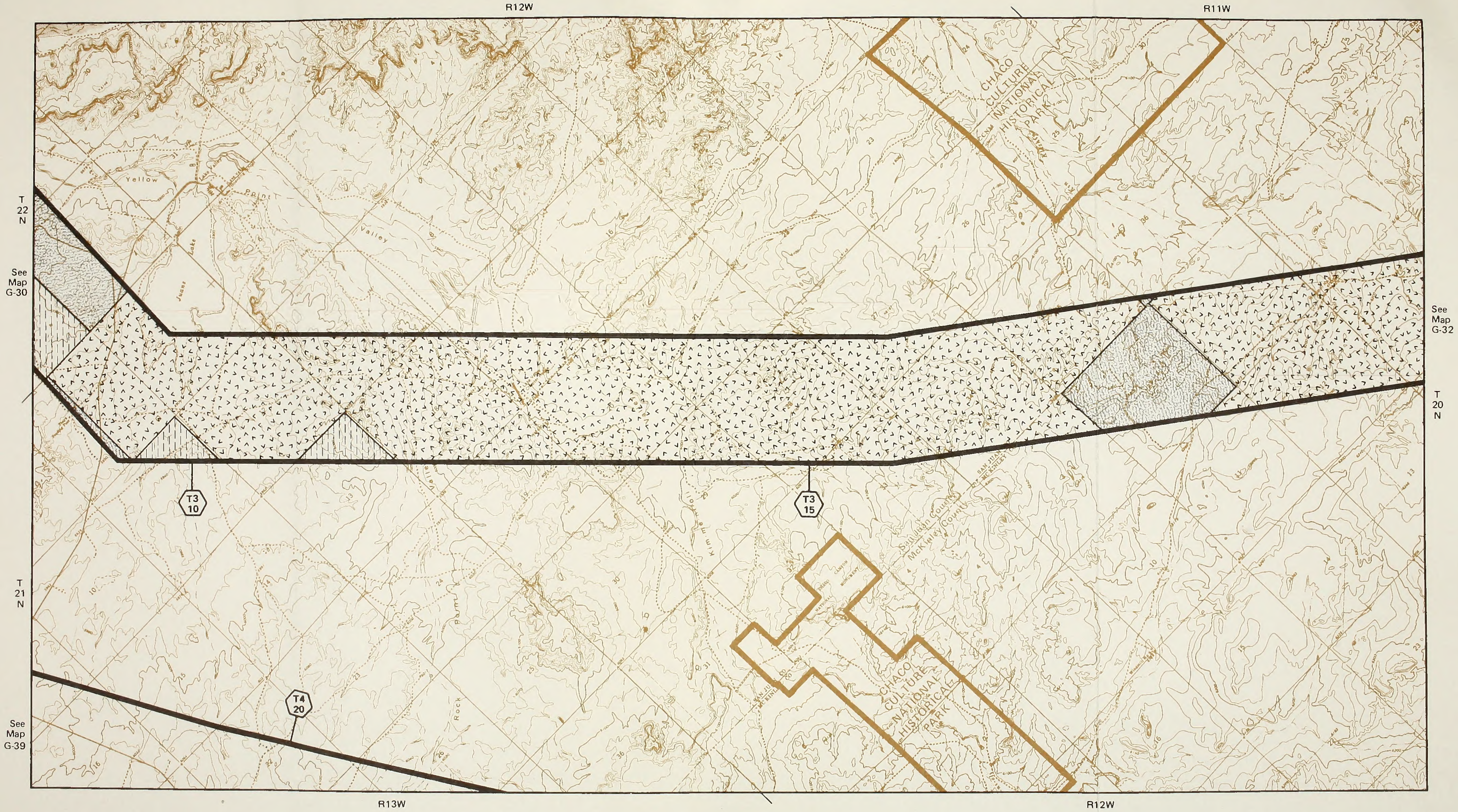
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-30



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

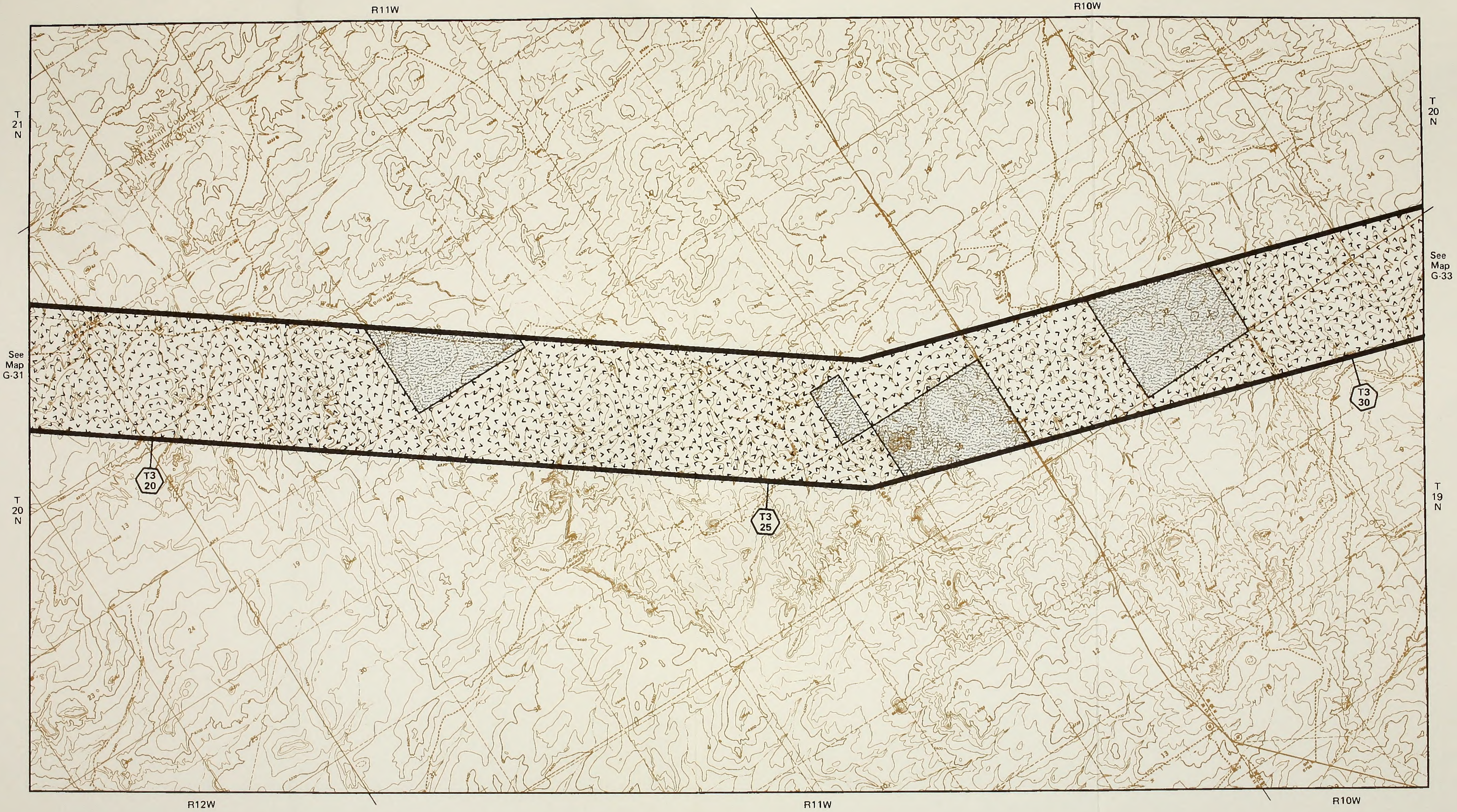
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-31



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

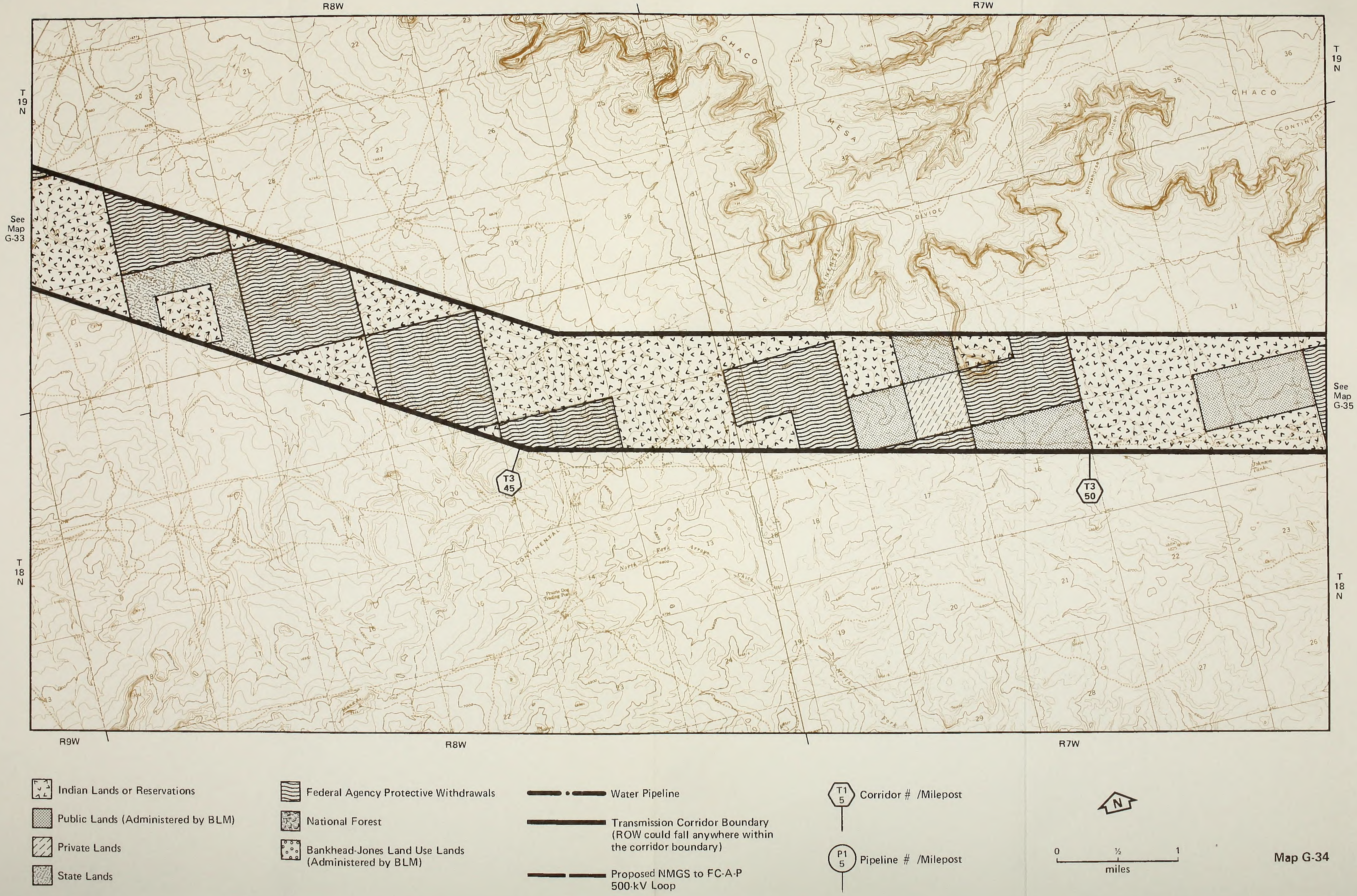
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

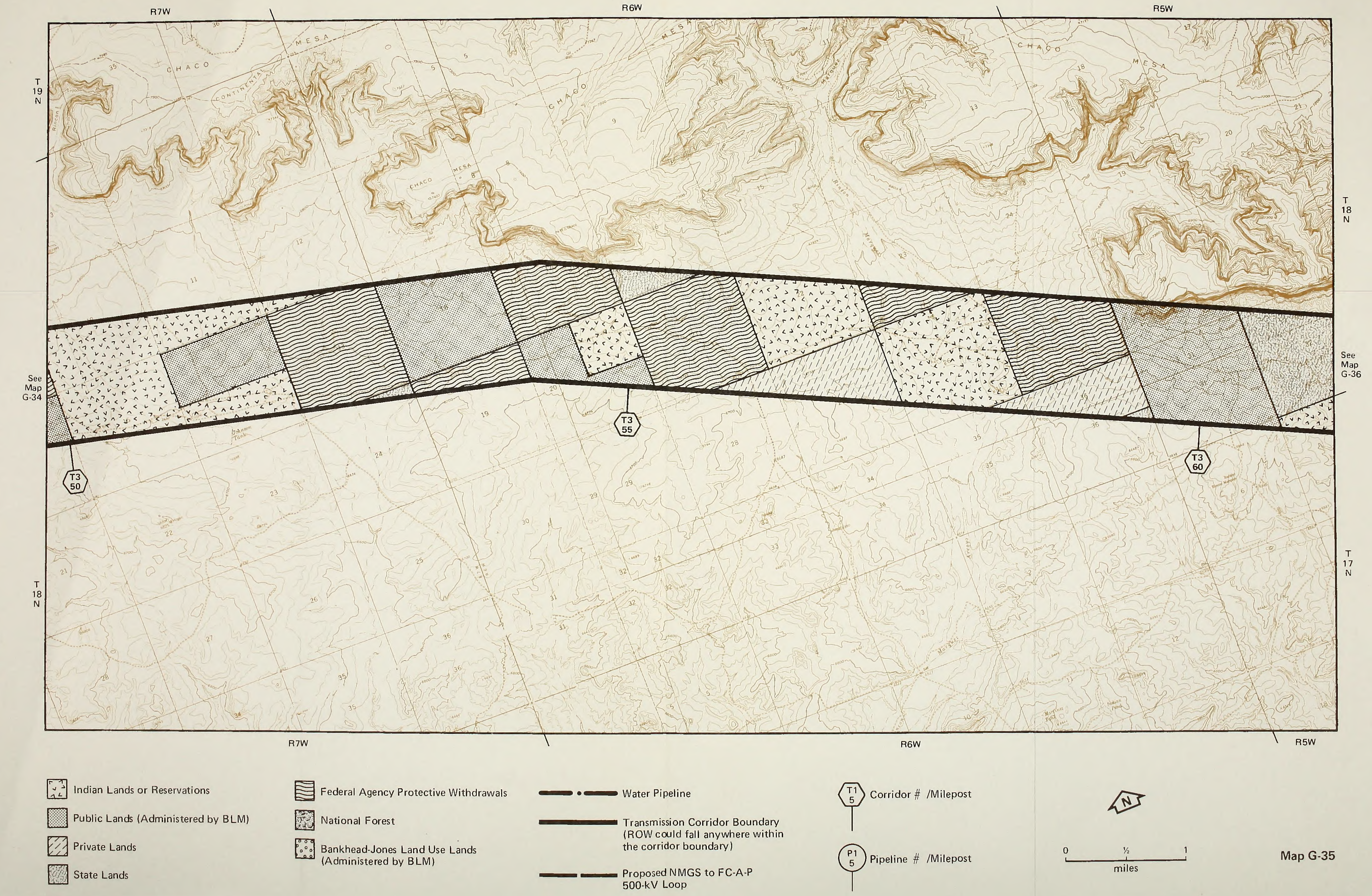
N

0 ½ 1
miles

Map G-32


R8W
R7W
T 19 N
T 18 N
See Map G-33
See Map G-35
CHACO
MESA
DIVIDE
CONTINENTAL
T3 45
T3 50
R9W
R8W
R7W
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0
½
1
miles

Map G-34



R7W
R6W
R5W
T 19 N
T 18 N
T 17 N
CHACO MESA
CONTINENTAL
See Map G-34
See Map G-36
T3 50
T3 55
T3 60
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-35

Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

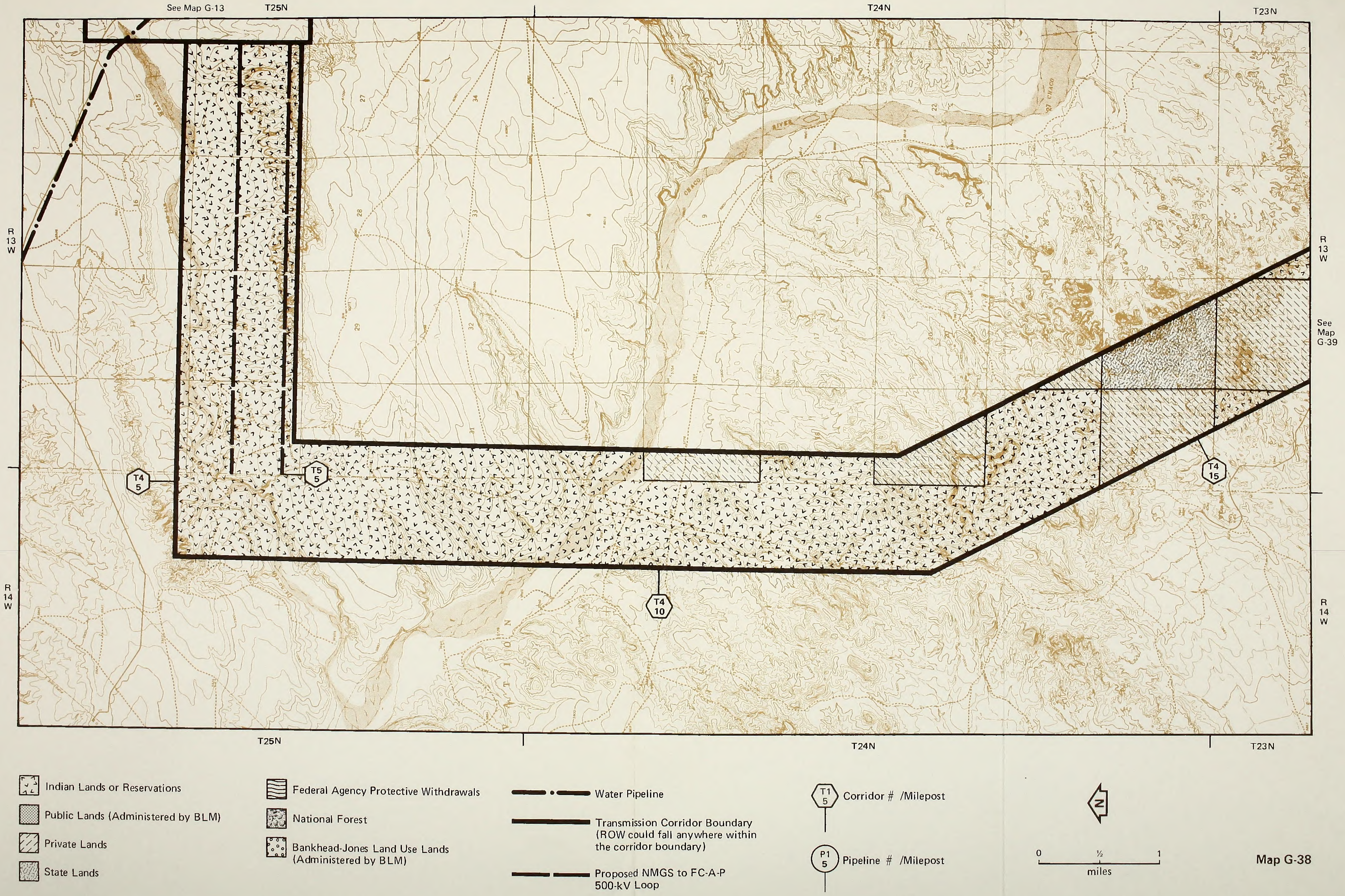
N

0 ½ 1 miles

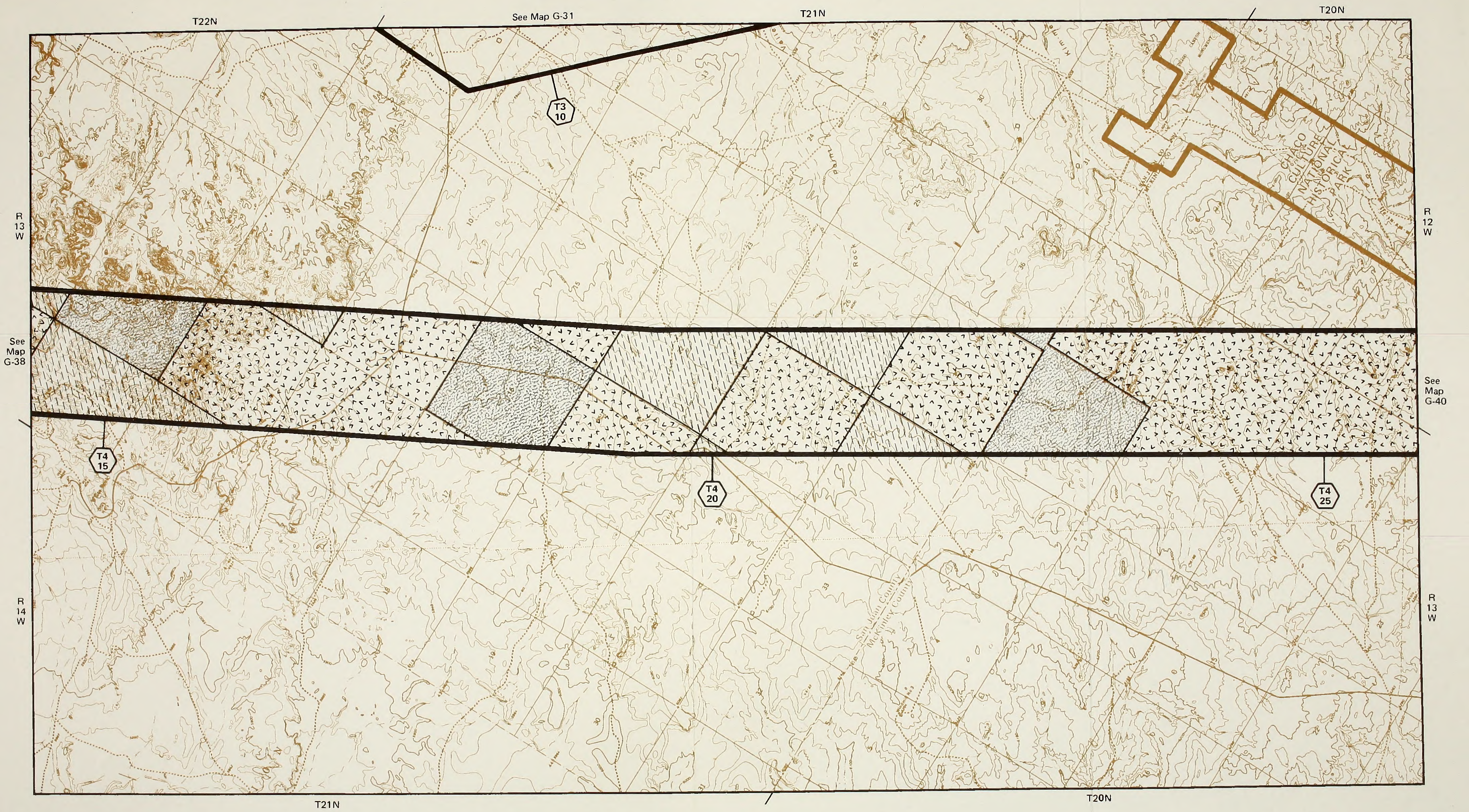
Map G-36

R4W
R3W
See Map G-20
R2W
T 18 N
T 17 N
T 16 N
See Map G-36
See Map G-21
T1 75
T3 70
T3 75
T2 70
R4W
R3W
R2W
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-37


See Map G-13
T25N
T24N
T23N
R 13 W
R 14 W
See Map G-39
T4 5
T5 5
T4 10
T4 15
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-38



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

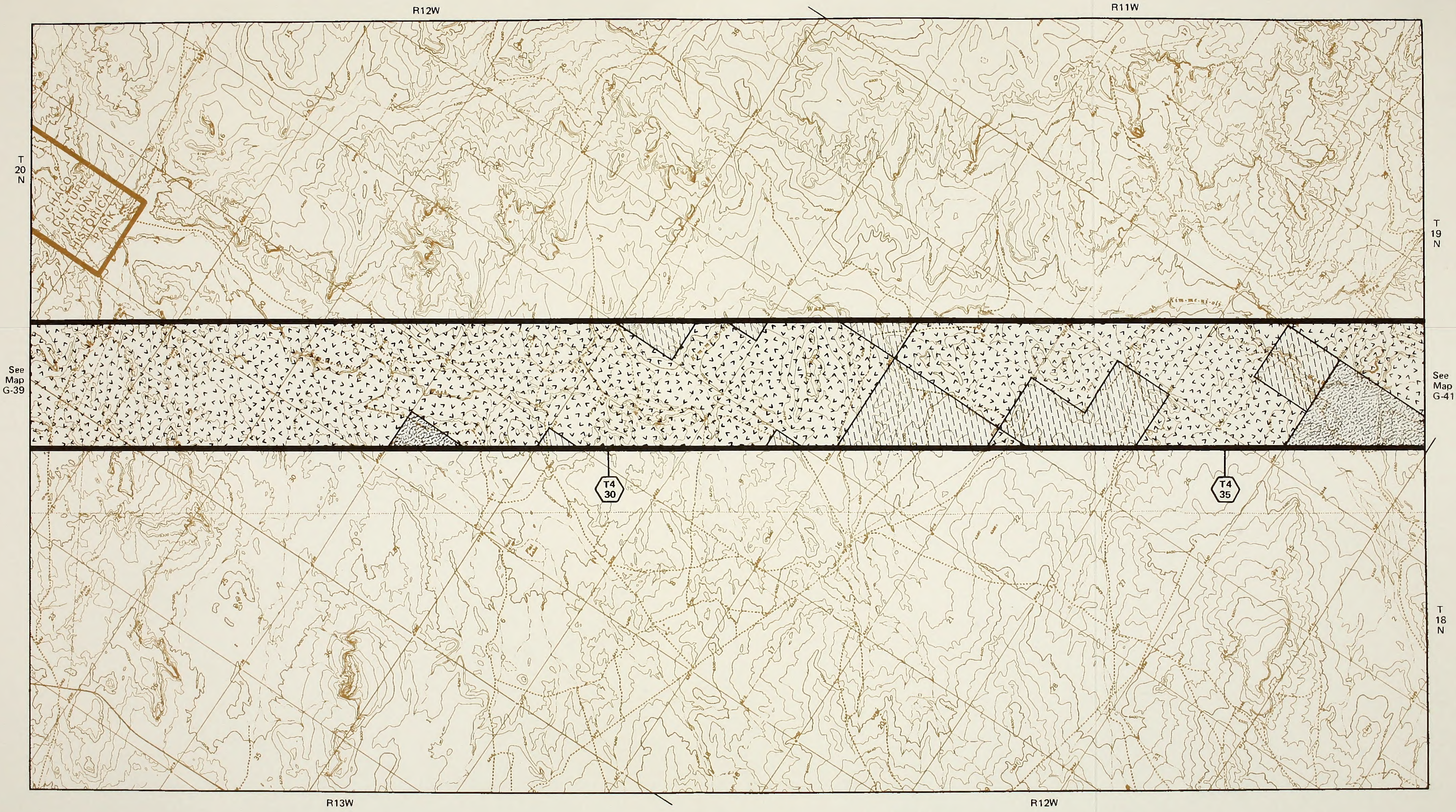
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-39



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

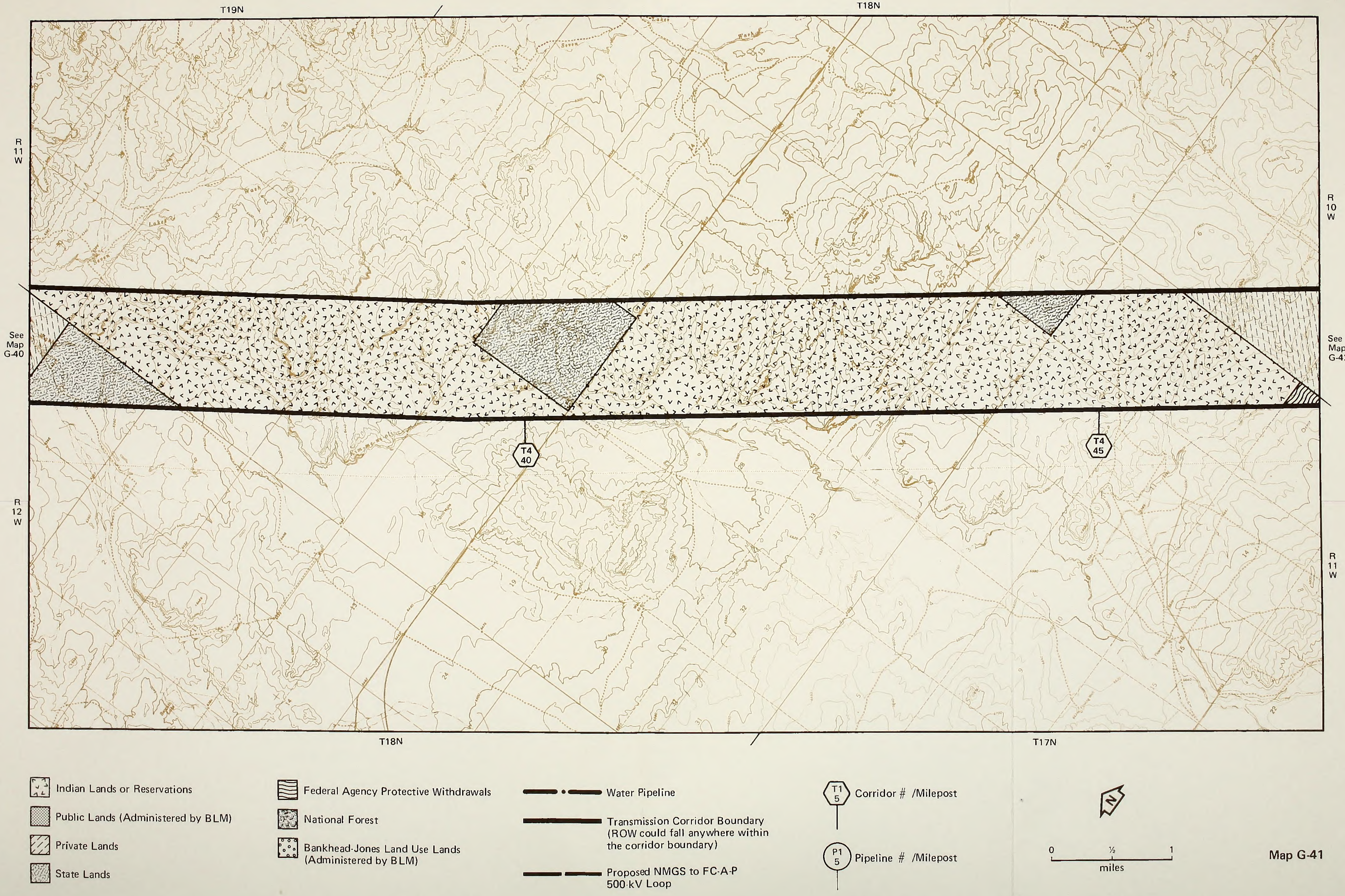
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

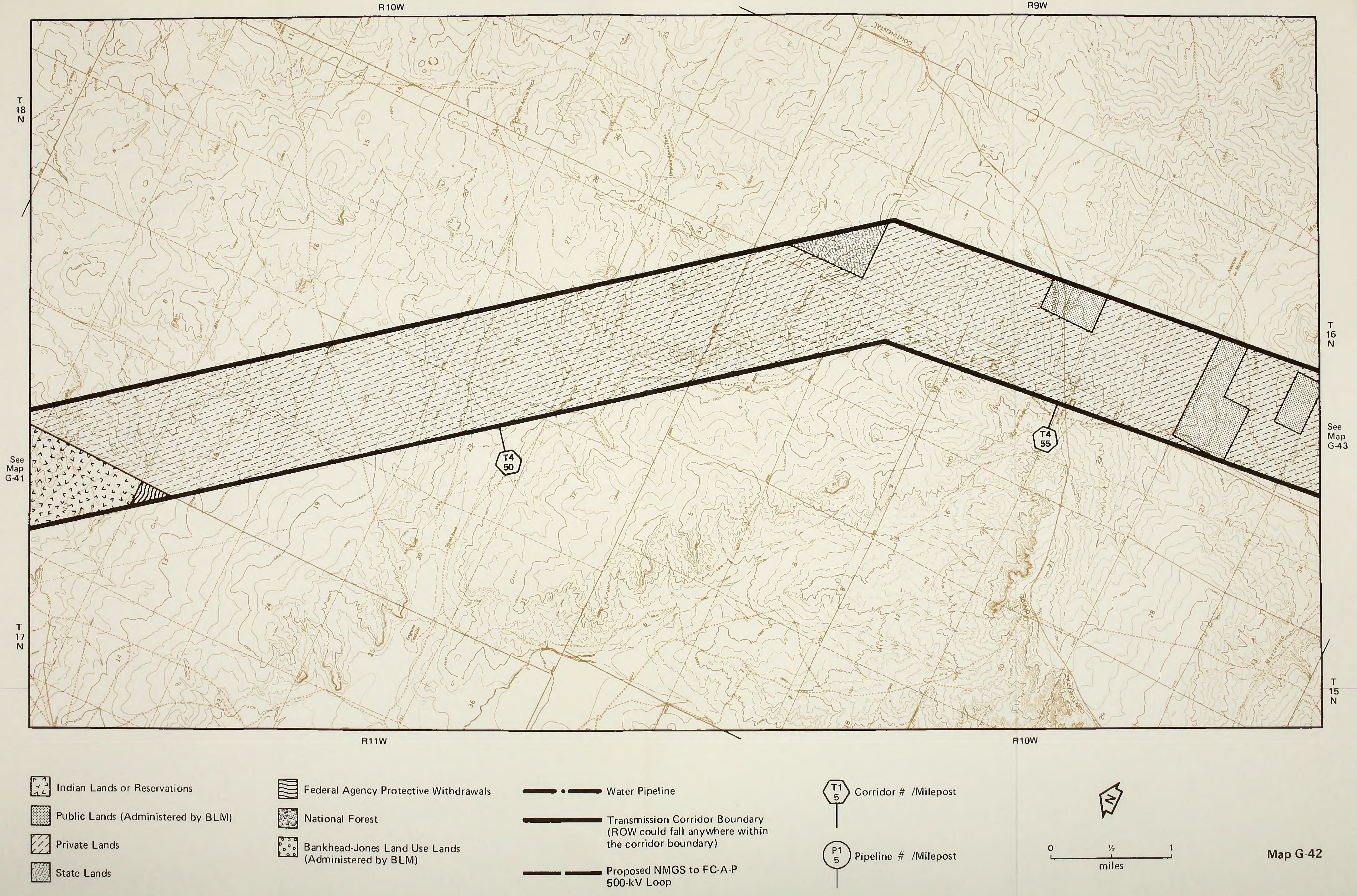
0 ½ 1
miles

Map G-40



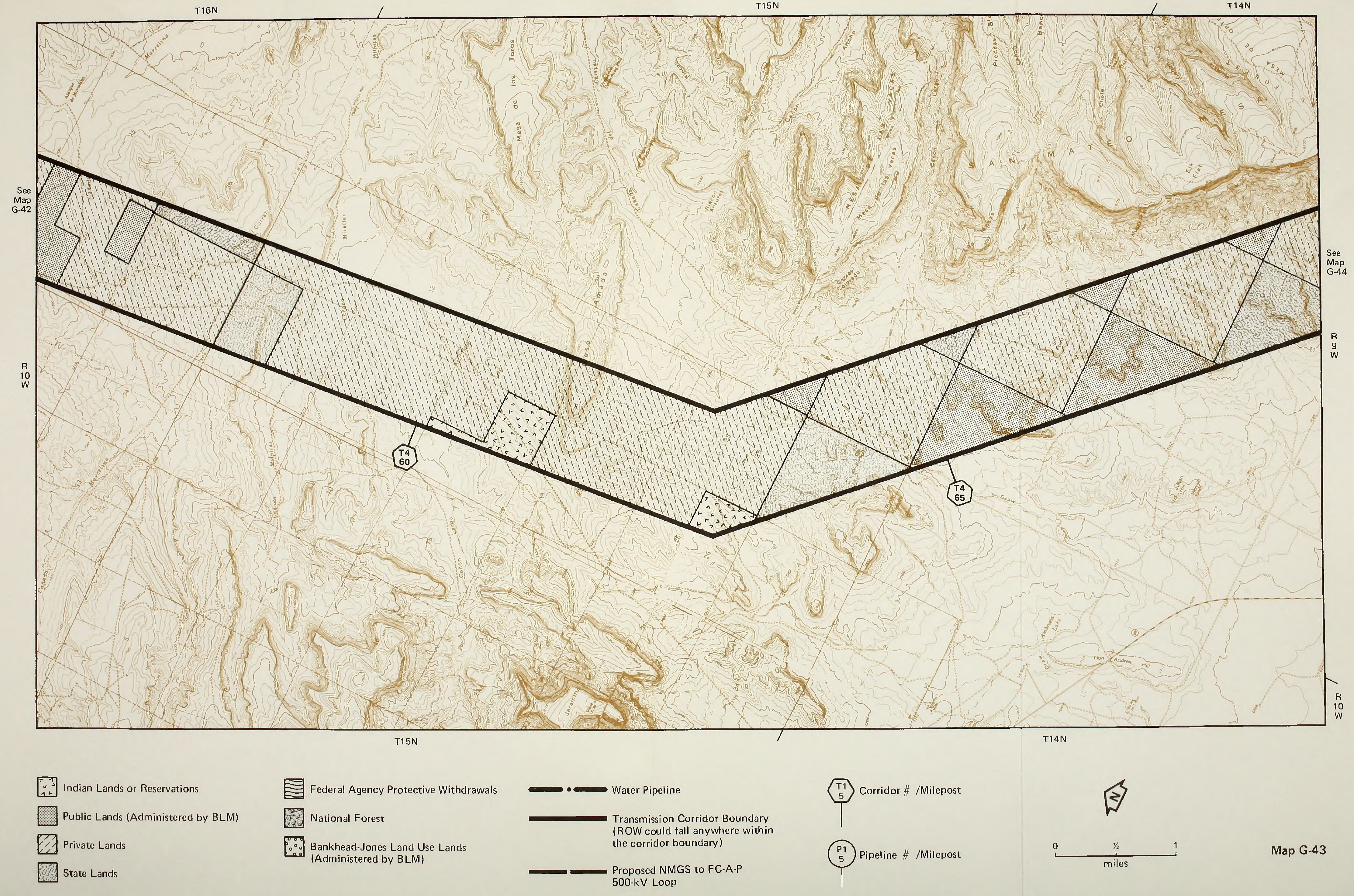
T19N
T18N
R 11 W
R 10 W
See Map G-40
See Map G-42
T4 40
T4 45
R 12 W
R 11 W
T18N
T17N
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

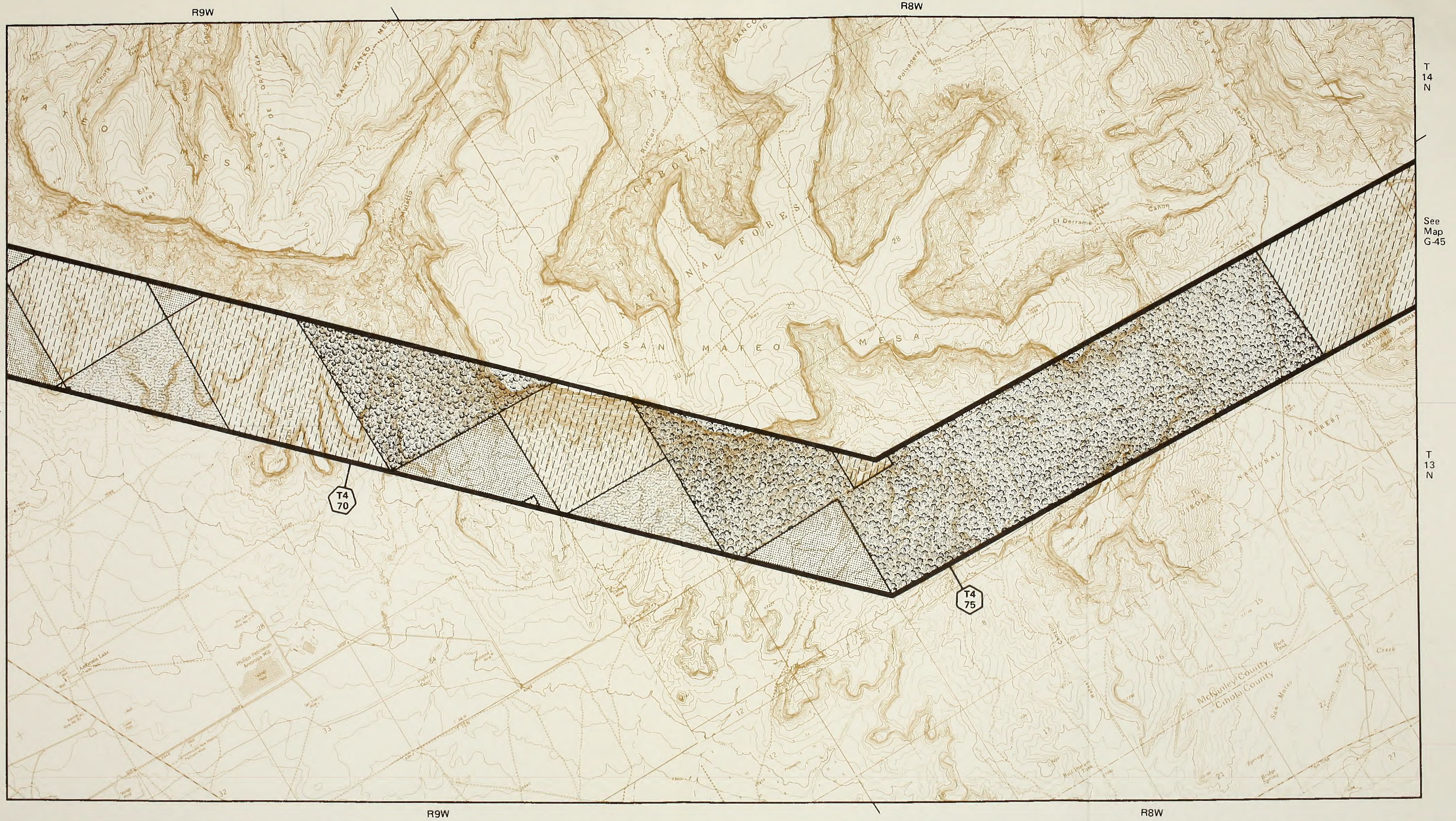
Map G-41



R10W
R9W
T
18
N
T
16
N
T
17
N
T
15
N
See
Map
G-41
See
Map
G-43
T4
50
T4
55
R11W
R10W
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands
(Administered by BLM)
Water Pipeline
Transmission Corridor Boundary
(ROW could fall anywhere within
the corridor boundary)
Proposed NMGS to FC-A-P
500-kV Loop
T1
5
Corridor # /Milepost
P1
5
Pipeline # /Milepost
N
0
½
1
miles

Map G-42


T16N
T15N
T14N
See Map G-42
See Map G-44
R 10 W
R 9 W
R 10 W
T15N
T14N
T4 60
T4 65
Mesa de los Toros
S A N M A T E O
Mesa de las Vacas
Don Andres Hill
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles
Map G-43



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

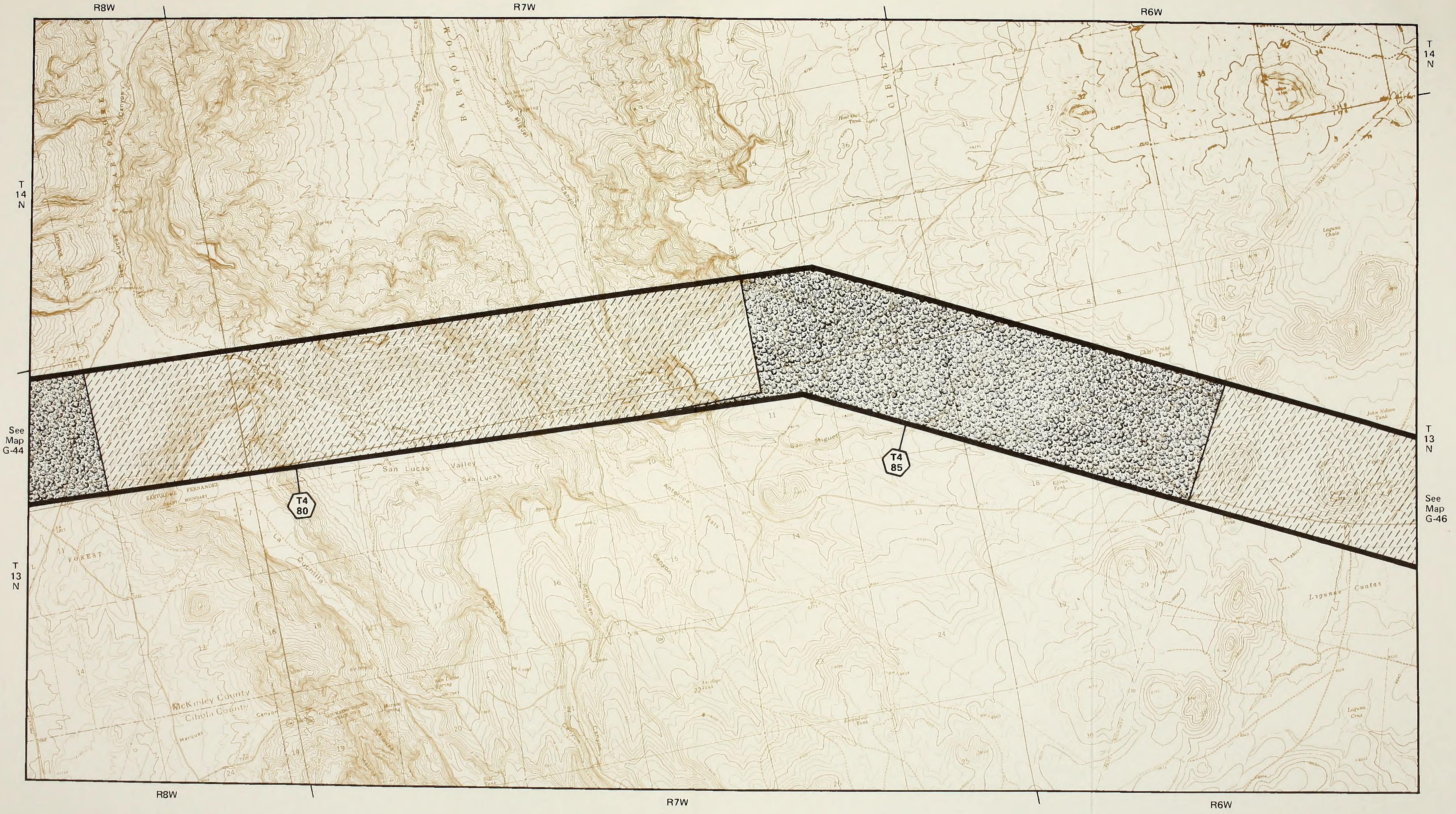
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-44



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-45

Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

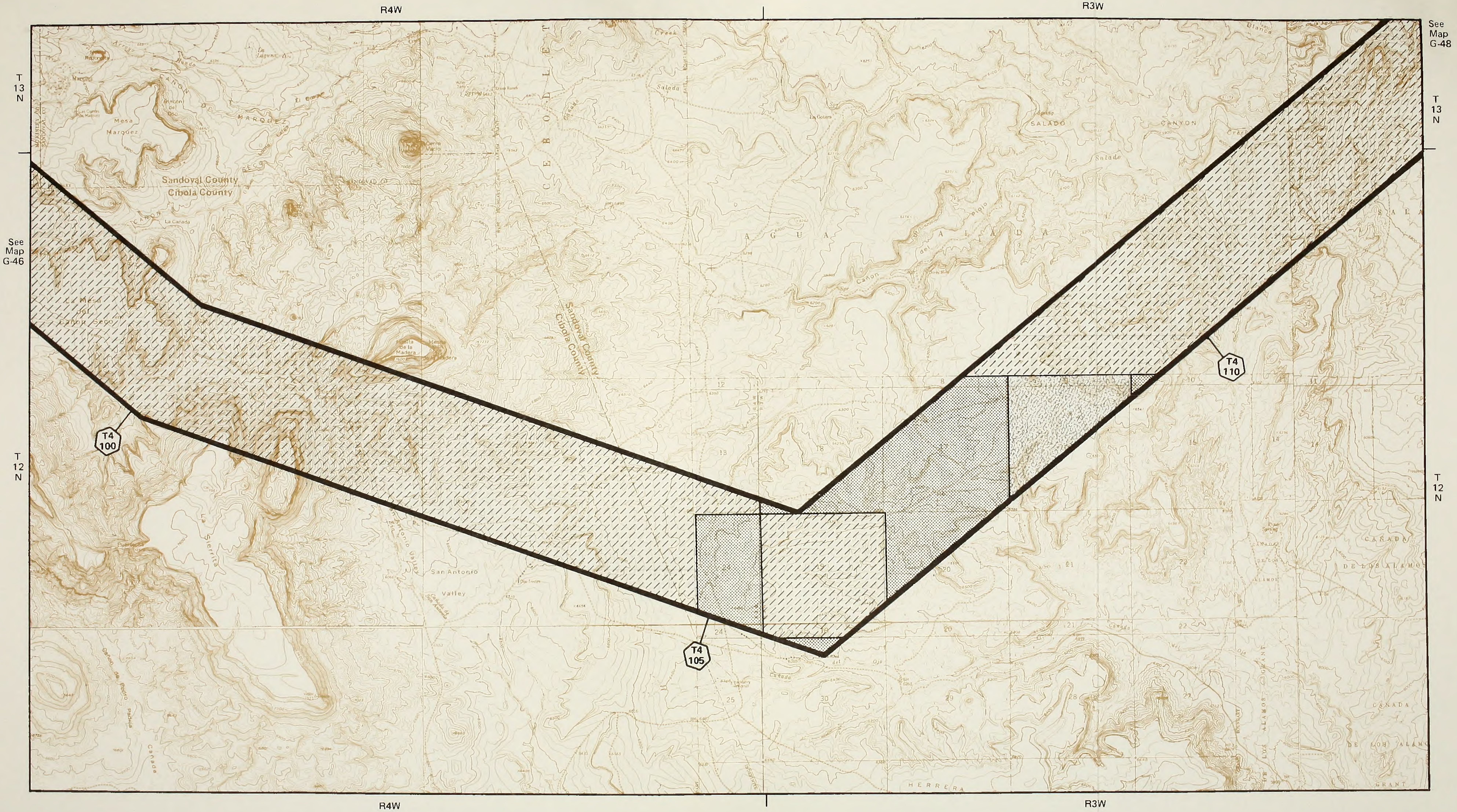
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-46



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

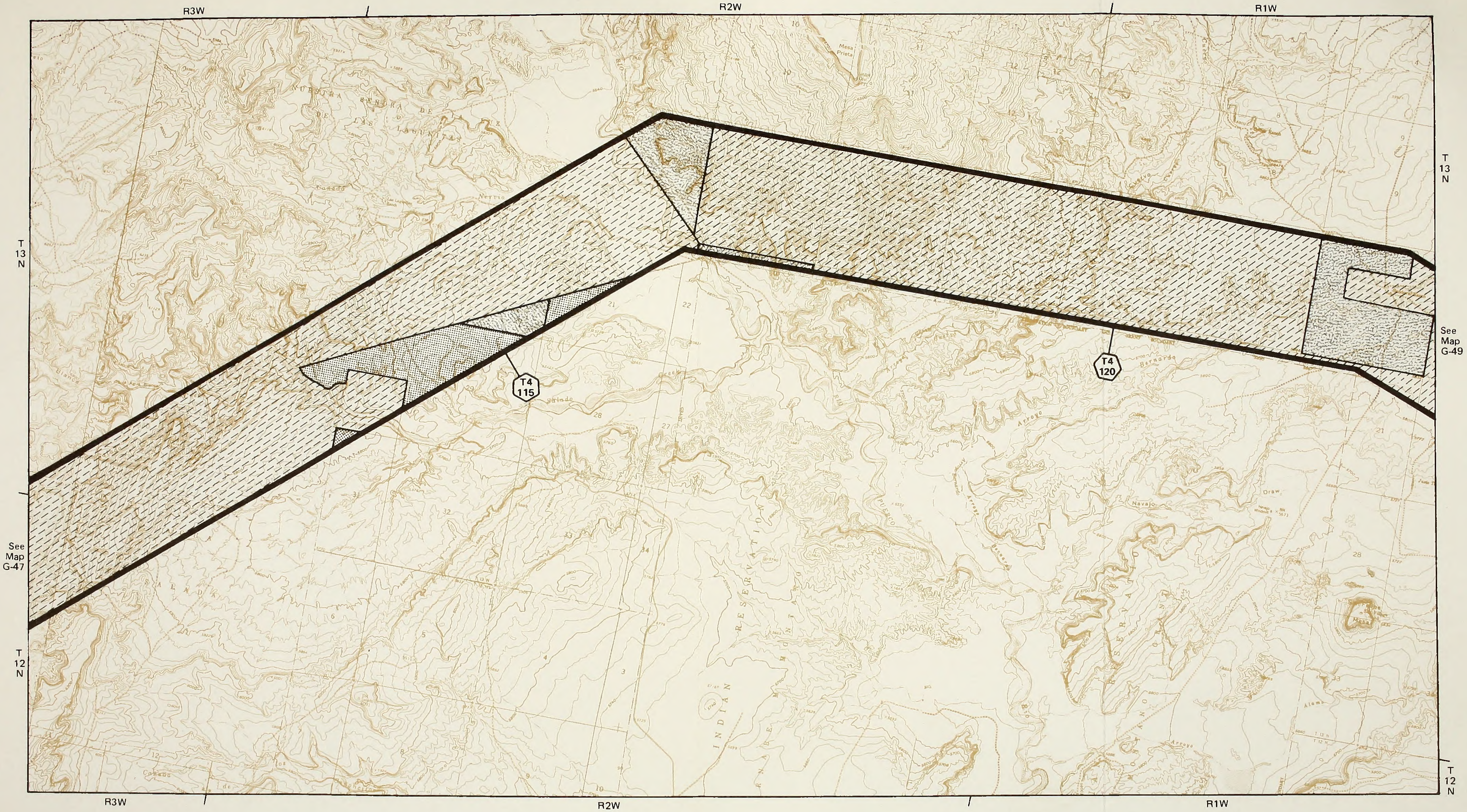
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1
miles

Map G-47



Indian Lands or Reservations

Public Lands (Administered by BLM)

Private Lands

State Lands

Federal Agency Protective Withdrawals

National Forest

Bankhead-Jones Land Use Lands (Administered by BLM)

Water Pipeline

Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)

Proposed NMGS to FC-A-P 500-kV Loop

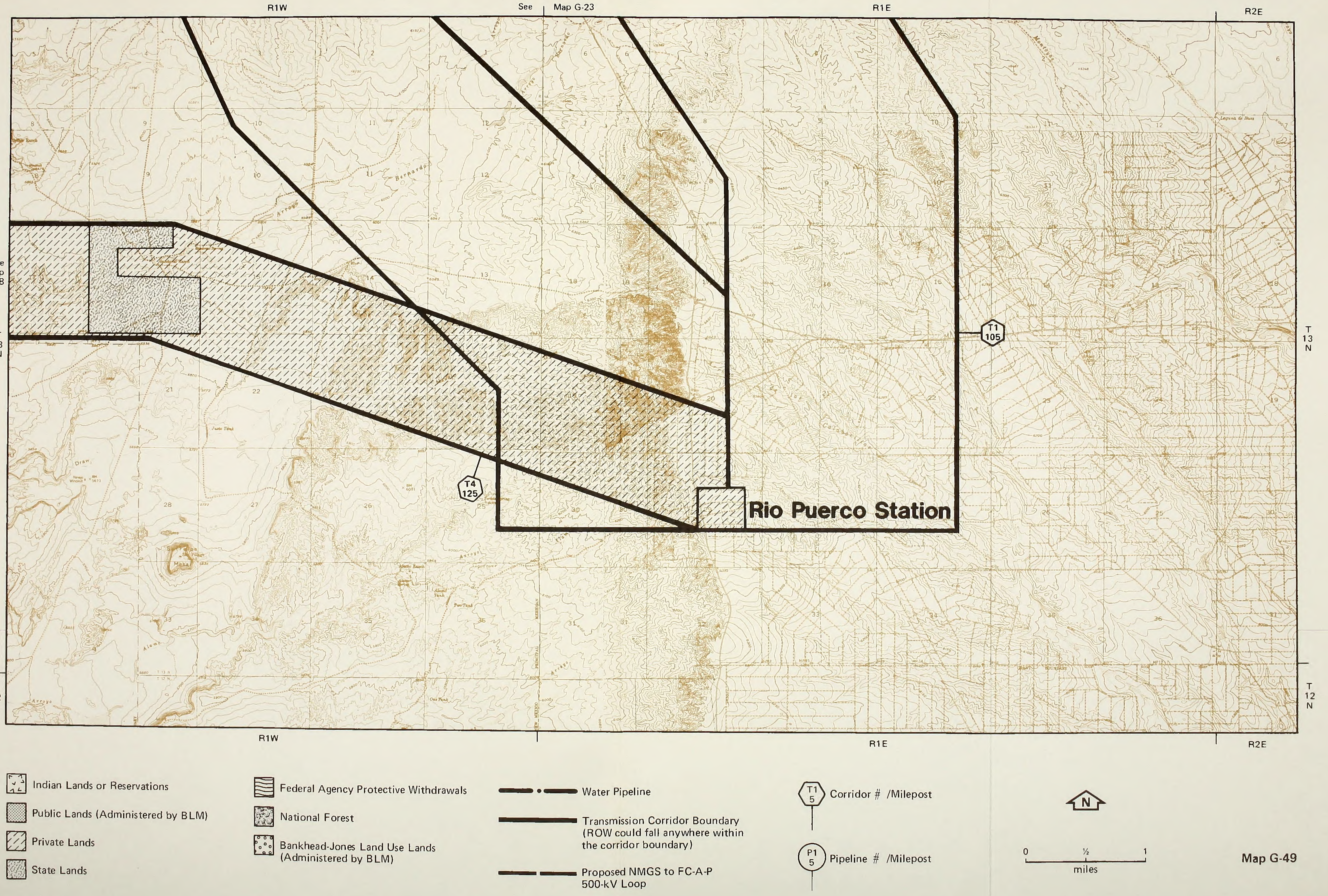
T1 5 Corridor # /Milepost

P1 5 Pipeline # /Milepost

N

0 ½ 1 miles

Map G-48


R1W
See Map G-23
R1E
R2E
See Map G-48
T 13 N
T 12 N
T4 125
T1 105
Rio Puerco Station
R1W
R1E
R2E
Indian Lands or Reservations
Public Lands (Administered by BLM)
Private Lands
State Lands
Federal Agency Protective Withdrawals
National Forest
Bankhead-Jones Land Use Lands (Administered by BLM)
Water Pipeline
Transmission Corridor Boundary (ROW could fall anywhere within the corridor boundary)
Proposed NMGS to FC-A-P 500-kV Loop
T1 5 Corridor # /Milepost
P1 5 Pipeline # /Milepost
N
0 ½ 1
miles

Map G-49

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225